CDM

RAC2
EPA Region 2

Health and Safety Plan

Old Roosevelt Field Contaminated Groundwater Area Superfund Site
Garden City, New York

EPA Contract No. EP-W-09-002
WA 023-RARA-02PE

April 2010

213067

Health and Safety Plan
Old Roosevelt Field Contaminated Groundwater Area Site
Remedial Action
Garden City, New York
Work Assignment No.: 023-RARA-02PE

Prepared for:
U.S. Environmental Protection Agency
290 Broadway
New York, New York 10007-1866

Prepared by:
CDM Federal Programs Corporation
125 Maiden Lane - 5th Floor
New York, New York 10038

EPA Work Assignment No.	: 023-RARA-02PE
EPA Region	: 2
Contract No.	: EP-W-09-002
CDM Federal Programs Corporation	
Document No.	: 3320-023-00389
Prepared by	: CDM
Site Manager	: Mr. Thomas Mathew
Telephone Number	: 732-590-4638
EPA Remedial Project Manager	: Ms. Caroline Kwan
Telephone Number	: 212-637-4275
Date Prepared	: April 6, 2010

OLD ROOSEVELT FIELD CONTAMINATED GROUNDWATER AREA SITE
REMEDIAL ACTION
GARDEN CITY, NEW YORK
HEALTH AND SAFETY PLAN
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APPENDICES

The CDM Health and Safety Manual (October 2006) will be kept on-site. It covers all the required Health and Safety Plan elements not detailed in this Health and Safety Plan Form.

ACRONYMS

APR	air purified respirator
AHA	activity hazard analysis
CDM	CDM Federal Programs Corporation
CFR	Code of Federal Regulations
CRZ	contamination reduction zone
EPA	(United States) Environmental Protection Agency
eV	photoionization potential
EZ	exclusion zone
H2SO4	sulfuric acid
H&S	health and safety
HASP	Health and Safety Plan
HAZWOPER	hazardous waste operations
HCl	hydrochloric acid
HSC	Health and Safety Coordinator
HSO	Corporate Health and Safety Officer
IDLH	immediately dangerous to life or health
IDW	investigation derived waste
LEL	lower explosive limit
µg/L	microgram per liter
mg/m^3	milligrams per cubic meter
O2	oxygen
O&M	operations and maintenance
OSHA	Occupational Health and Safety Act
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
RA	Remedial Action
RI	Remedial Investigation
SCBA	self contained breathing apparatus
SSN	social security number
SZ	support zone
TBD	to be determined
TCE	trichloroethene
TLV	threshold limit value
TWA	time weighted average

SITE HEALTH AND SAFETY PLAN FORM		CDM FEDERAL PROGRAMS CORPORATION

PROJECT NAME: Old Roosevelt Field Remedial Action (RA)	CONTRACT NO. EP-W-09-002
JOB SITE ADDRESS: Clinton Road	CLIENT: USEPA Region 2
Garden City, Nassau County, New York	WORK ASSIGNMENT: 023-RARA-02PE
SITE CONTACT: Thomas Mathew, Site Manager (CDM)	CLIENT CONTACT: Caroline Kwan
PHONE NO.: (732) 590-4638	PHONE NO.: (212) 637-4275
( ) AMENDMENT NO. 0	

OBJECTIVES OF FIELD WORK:
The objective of the field work is to implement the Remedial Action (RA) in accordance with the Remedial Design completed by CDM in September 2009. The work includes installation of extraction and monitoring wells, aquifer testing, groundwater sampling, water level monitoring, management and disposal of investigation derived waste (IDW) generated during drilling activities, construction of groundwater treatment system, completion of yard piping, extraction well head completion, system startup testing and first year operation, maintenance and monitoring of the groundwater treatment facility.

The RA work has been divided into two phases, Phase 1 and Phase 2. Phase 1 work includes installation of extraction and monitoring wells, aquifer testing, groundwater sampling, water level monitoring, and management and disposal of IDW. Phase 2 work includes construction of groundwater treatment system, completion of yard piping, extraction well head completion, system startup testing and first year operation, maintenance and monitoring of the groundwater treatment facility.

Phase 1 work to be performed by CDM and its drilling and IDW subcontractors, and Phase 2 work to be performed by CDM RA Subcontractor. CDM will oversee all subcontractors work.

All tasks performed by CDM will be conducted in compliance with the CDM Health and Safety Program Manual (October 2006) and Hazwoper Standard 29CFR1910.120. The CDM Health and Safety Program Manual and the Material Safety Data Sheets (Attachment C) will be kept on site during field activities. The RA Subcontractor will be required to perform the work in accordance with Section 01351 of the Subcontract Specifications (Safety, Health and Emergency Response) and in accordance with their own site-specific Health and Safety Plan, which will be approved by CDM.

TYPE: Check as many as applicable

( ) Active	( ) Landfill	( ) Unknown
(X) Inactive	( ) Uncontrolled	( ) Military
( ) Secure - site facility	( ) Industrial	( ) Other **specify**:
(X) Unsecure	( ) Recovery	(X) Residential:
( ) Enclosed space	(X) Well Field	(X) Commercial:

DESCRIPTION AND FEATURES:
The Site is an area of groundwater contamination within the Village of Garden City, in central Nassau County, New York. The Site is located on the eastern side of Clinton Road, south of the intersection with Old Country Road (see figure on Page 2). It includes a thin strip of open space along Clinton Road (known as Hazelhurst Park), a large retail shopping mall with a number of restaurants, and a movie theater. Several office buildings (including Garden City Plaza) share parking space with the shopping mall. The Village of Garden City supply wells are located in the vicinity. Two recharge basins are directly east (Pembrook, owned by the mall) and south of the mall area (Nassau County Storm Water Basin number 124).

SURROUNDING POPULATION: (X) Residential ( ) Industrial ( ) Rural ( ) Urban ( ) OTHER: Commercial

SITE MAP

adapted from NYSDEC Interactive Mapping Gateway: http://www.nygis.state.ny.us/gateway/index.html

HISTORY:
Roosevelt Field was used for a variety of aviation activities from 1911 until May 1951. The original airfield, known as the "Hempstead Plains Aerodrome", encompassed 900 to 1,000 acres east of Clinton Road and south of Old Country Road. The United States military began using the Hempstead Plains field before the U.S. entered World War I. During World War I, the airfield was taken over as a training center for military pilots and renamed Hazelhurst Field. On September 24, 1918, the Army changed the name to Roosevelt Field.

After World War I, the U.S. Air Service authorized some companies to operate from Roosevelt Field but maintained control until July 1, 1920, when the Government sold its buildings and improvements and relinquished control of the field. Subsequently, the property owners sold portions along the southern edge of the field and split the remainder of the property into two separate fields, Roosevelt Field on the eastern half and Curtis Field on the west. Both fields were bought in 1929 by Roosevelt Field, Inc., and the consolidated property called Roosevelt Field. The eastern field was sold in 1936 and became a racetrack; the western field at the corner of Clinton and Old Country Roads continued to operate as an aviation center. During World War II, Roosevelt Field was used by the Navy and Army. After the war, Roosevelt Field reverted to a commercial airport until it closed in May 1951. Building construction at the site began in 1956. The Roosevelt Field Shopping Mall and Garden City Plaza currently occupy the area that was Roosevelt Field.

Currently, the contaminated plume is documented by the presence of PCE and TCE at concentrations that exceed health benchmarks. Historically, the highest levels of TCE (at 38,000 µg/L in 1984) were detected in former cooling water well N8050, located in the vicinity of current SVP-02, approximately 2,000 feet north-northeast of the Garden City wells. The two Garden City supply wells and well N8050 are located on the property that historically was Roosevelt Field. The sources of contamination are suspected to be the airport hangar areas, but specific sources have not been determined.

Several investigations of groundwater contamination in the vicinity of Old Roosevelt Field have been conducted. CDM conducted remedial investigation and pre-remedial design investigation. The historical results can be found in the Roosevelt Field Contaminated Groundwater Area Site Remedial Investigation Report (CDM 2007), and two pre-design investigation technical memorandums (CDM 2008 and 2009).

WASTE TYPES: (X) Liquid (X) Solid (X) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

(X) Corrosive (X) Flammable ( ) Radioactive

( ) Toxic (X) Volatile ( ) Reactive

( ) Inert Gas ( ) Unknown ( ) Other specify:

WORK ZONES: The exclusion zone (EZ) includes all active areas in which contaminants may affect personnel through exposure routes, and /or in which heavy equipment and other hazardous materials may be used. Where space is available, the diameter of the EZ around the drill rig will be equal to the height of the mast. The exclusion zone will be marked off by traffic cones or flagged with caution tape at each location. The contamination reduction/ decontamination zone (CRZ) is the transition area between the EZ and the support zone (SZ) and will be established at the sample location for groundwater sampling or the field trailer for drilling equipment decontamination. The field trailer and associated lay down areas will be considered the support zone. The buddy system will be in effect at all times.

HAZARDS OF CONCERN:

(X) Heat Stress (guideline attached) (X) Noise (guideline attached)

(X) Cold Stress (guideline attached) (X) Inorganic Chemicals

( ) Explosive/Flammable (X) Organic Chemicals

( ) Oxygen Deficient (X) Motorized Traffic (guideline attached)

( ) Radiological (X) Heavy Machinery (guideline attached)

( ) Biological - deer ticks, poison ivy, oak and sumac (X) Slips, Trips & Falls (guideline attached)

( ) Other specify:

PAST DISPOSAL METHODS AND PRACTICES:
The US Military, particularly the Air Force, former occupant of the site, poured solvents including TCE onto the ground at all of their bases. Standard maintenance at almost every air force base involved spraying planes with solvents to clean and de-ice them.

CDM procedures and guidelines are included in Appendix B.

SITE HEALTH AND SAFETY PLAN FORM		CDM FEDERAL PROGRAMS CORPORATION

HAZARDOUS MATERIAL SUMMARY: Bold waste type and estimate amounts by category

CHEMICALS Amounts/Units:	SOLIDS Amounts/Units:	SLUDGES Amounts/Units:	SOLVENTS Amounts/Units:	OILS Amounts/Units:	OTHER Amounts/Units:
Acids	Flyash	Paint	**Halogenated Solvents**	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Pigments	Hydrocarbons	Gasoline	Pharmaceutical
Caustics	Milling/Mine Tailings	Metal Sludges	Alcohols	Diesel Oil	Hospital
Pesticides	Ferrous Smelter	POTW Sludge	Ketones	Lubricants	Radiological
Dyes/Inks	Non-ferrous Smelter	Aluminum	Esters	PCBs	Municipal
Cyanides	Metals	Distillation Bottoms	Ethers	Polynuclear Aromatics	**Construction**
Phenols	Other	Other	Other	Other	Munitions
Halogens	**Specify:**	**Specify**:	**Specify: TCE and PCE**	**Specify:**	Other
Dioxins					**Specify:**
Other					
Specify: H_2SO_4, HCl (used for sample preservation)					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (X) Low ( ) Unknown
JUSTIFICATION: Significant characterization of site contamination has already been performed. No elevated PID readings were detected in the breathing zone during the RI and pre-design investigation performed by CDM. Proper PPE will be used for activities where personnel will come in contact with contaminated groundwater (during sampling, etc.)

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (X) Low ( ) Unknown

BACKGROUND REVIEW: (X) COMPLETE ( ) INCOMPLETE

KNOWN CONTAMINANTS	Media	HIGHEST OBSERVED CONCENTRATION [1,2]	PEL/TLV ppm or mg/m^3 **(specify)**	IDLH ppm or mg/m^3 **(specify)**	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL (eV)
Tetrachloroethene (PCE)	Groundwater	300 µg/L	25 ppm OSHA 100 ppm	150 ppm (Ca)	Eye and nose irritation, nausea, flushed face and neck	9.32
Trichloroethene (TCE)	Groundwater	960 µg/L	50 ppm OSHA 100 ppm	1000 ppm	Vertigio, visual disturbance, headache, drowsiness	9.45
1,2-Dichloroethene	Groundwater	69 µg/L	200 ppm	1000 ppm	Eye irritation, central nervous system depression	10.0
1,1-Dichloroethene	Groundwater	23 µg/L	1 ppm (No OSHA PEL)	> 500 ppm	Irritated eyes, skin, throat or breathing difficulty	10.0

[1] Highest Observed Concentration is derived from the data collected during the Remedial Investigation and Pre-Remedial Design Investigation.
[2] Vinyl chloride was not detected in any samples in previous investigation, so no screening for vinyl chloride will be conducted.

Ca	carcinogenic	mg/m^3	milligrams per cubic meter
PEL	Permissible Exposure Limits	ppm	parts per million
TLV	Threshold Limit Value	µg/l	micrograms per liter
IDLH	Immediately Dangerous to Life or Health	eV	electron volt

SITE HEALTH AND SAFETY PLAN FORM		CDM FEDERAL PROGRAMS CORPORATION

FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION	Type	Primary	Contingency	HAZARD SCHEDULE
1 Installation of extraction and monitoring well installation	**Intrusive**	**D Modified**	**C or Exit Area**	Hi / Med / **(Low)** April 2010 to Fall 2010
2 Aquifer testing, groundwater sampling; oversight operation of a temporary onsite water treatment system and discharge, IDW management and disposal; and collecting synoptic water levels during each round of sampling	**Intrusive**	**D Modified**	**C or Exit Area**	Hi / Med / **(Low)** Fall 2010
3 Resident Engineering during groundwater treatment facility construction, site/civil construction; treatment plant startup and initial testing	**Intrusive**	**D**	**D Modified**	Hi / Med / **(Low)** August 2010 to date TBD
4 Oversight of RA Subcontractor performing treatment system operation, maintenance, and monitoring	**Non-Intrusive**	**D**	**D Modified**	Hi / Med / **(Low)** Fall 2011 to Fall 2012
5 Site visit, Pre-final/Final inspections	**Non-Intrusive**	**D**	**D Modified**	Hi / Med / **(Low)** Fall 2011

PERSONNEL AND RESPONSIBILITIES

NAME	FIRM	CDM HEALTH CLEARANCE	RESPONSIBILITIES	ONSITE
Thomas Mathew, PE	CDM	*	Site Manager	1,2,3,4,5
Muzaffar Rahmani	CDM	*	Project Engineer	1,2,3,4,5
Frank Robinson	CDM	*	Field Team Leader/ Resident Engineer and H&S Representative	1,2,3,5
Seth Cleaver	CDM	*	Geology Oversight	1,2
Sean O'Hare	CDM	*	Field Scientist	2
Melissa Koberle	CDM	*	Field Scientist	2
Driller and IDW Subcontractor Personnel	TBD	*	Drilling and IDW	1,2
RA Subcontractor Personnel	TBD	**	Construction and O&M	3,4,5

* Staff will have health clearance prior to start of field activities.
** Only RA Subcontractor personnel that will be potentially exposed to contamination will be required to have Health Clearance

SITE HEALTH AND SAFETY PLAN FORM		CDM FEDERAL PROGRAMS CORPORATION

PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Use copies of this sheet if needed.

BLOCK A TASKS: 1, 2 (X) Primary
LEVEL: D Modified

Respiratory: (X) Not Needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
(X) Safety Glasses: as needed
( ) Face Shield:
( ) Goggles:
(X) Hard Hat: if over head hazard exists
( ) Other:

Boots: ( ) Not Needed
(X) Boots: Leather steel-toed and shanked work boots
(X) Over boots: As needed for site conditions

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
(X) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
(X) Gloves: Nitrile/Latex (as required)
(X) Overgloves: Nitrile as required during decontamination

(X) Other - Hearing protection, Sun Screen as required

BLOCK B TASKS: 1,2 (X) Contingency
LEVEL: C or Exit Area

Respiratory: ( ) Not Needed
( ) SCBA, Airline:
( ) APR:
(X) Cartridge: Organic Vapor and Dust
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
(X) Safety Glasses: as needed
( ) Face Shield:
( ) Goggles:
(X) Hard Hat: if over head hazard exists
( ) Other:

Boots: ( ) Not Needed
(X) Boots:Leather steel-toed and shanked work boots
(X) Overboots: As needed for site conditions

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
(X) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
(X) Gloves: Nitrile/Latex (as required)
(X) Overgloves: Nitrile as required during decontamination

(X) Other - Hearing protection, Sun Screen as required

BLOCK C TASKS: 3,4,5 (X) Primary
LEVEL: D

Respiratory: (X) Not Needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
( ) Other:

Boots: ( ) Not Needed
(X) Boots: Leather steel-toed and shanked work boots
( ) Overboots: As needed for site conditions

Prot. Clothing: (X) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron
( ) Tyvek Coverall: Optional
( ) Saranex Coverall:
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
(X) Gloves: Nitrile/Latex – as required
( ) Overgloves:

( ) Other - Hearing protection, as required

BLOCK D TASKS: 3,4,5 (X) Contingency
LEVEL: D Modified

Respiratory: (X) Not Needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge: Organic Vapor and Dust
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
( ) Other:

Boots: ( ) Not Needed
(X) Boots: Leather steel-toed and shanked work boots
( ) Overboots: as needed for site conditions

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
(X) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves
(X) Gloves: Nitrile/Latex – as required
( ) Overgloves: Nitrile as required during decontamination

( ) Other - Hearing protection, as required

MONITORING EQUIPMENT: Specify by task. Indicate type as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES		COMMENTS (Includes schedules of use)
Photoionization Detector Type MiniRAE (X) 11.7 ev or (X) 10.2 ev ( ) ___ ev	1, 2	**Specify:** * 0 - 5.0 ppm *5.0 - 25.0 ppm *>25.0 ppm	 Level D/Modified Level D Evacuate area, contact HSC, upgrade to Level C - contingency PPE Exit site & contact HSC * Above background sustained in breathing zone for 5 minutes.	( ) Not Needed
Combustible Gas Indicator	1, 2	0-10% LEL 10-25% LEL >25% LEL 21.0% O2 <21.0% O2 <19.5% O2	No explosion hazard Potential explosion hazard; notify HSC Explosion hazard; interrupt task/evacuate Oxygen normal Oxygen deficient Interrupt task/evacuate	
Other Visible dust or unusual vapors (odors)	All	**Specify:** If team notices visible dust or encounters nuisance dust resulting in irritation of eyes or throat, or encounters unusual odors, engineering controls will be used to suppress dust. If required, they will upgrade respiratory protection or exit site.		( ) Not Needed

Note: For Tasks 3,4 & 5, RA Subcontractor will perform air monitoring activities in accordance with the Contractor's approved Health and Safety Plan.

DECONTAMINATION PROCEDURES

Personalized Decontamination	Sampling Equipment Decontamination	Heavy Equipment Decontamination
Respirators will be selected, used, decontaminated, and stored in accordance with CDM H&S Manual as based on OSHA 1910.134 The personal decontamination station will move from location to location based on work site. Wash hands and face if necessary with soap and water upon doffing personal protective equipment. Wash well before hand-to-mouth contact is made. Workers will remove protective clothing in this order: - equipment drop - hard hat - boot covers - outer gloves - Tyvek - respirator (if used) - inner gloves - face and hand wash WASH HANDS AND FACE PRIOR TO ANY INGESTION OF FOOD OR LIQUIDS. ( ) Not Needed	All sampling equipment will be thoroughly decontaminated as follows: 1) Wash and scrub with low phosphate detergent 2) Potable tap water rinse* 3) Rinse with 10 percent nitric acid, ultrapure (1 percent for carbon steel implements) when sampling for inorganics 4) Deionized water rinse 5) Isopropyl alcohol rinse (pesticide grade or better) when sampling for organics 6) Thorough rinse with deionized, demonstrated analyte-free water (at least five times the amount of solvent used in step 5) 7) Air dry 8) Wrap in aluminum foil for transport * Potable water must be from a municipal water treatment supply system. Phthalate-free gloves must be worn when using solvents. Water quality measurement probes must be rinsed with deionized water between uses. Water level indicator tape must be rinsed/wiped with wet paper towel between uses. If petroleum product is present, requires low phosphate detergent rinse as well. ( ) Not Needed	All down-hole equipment and tool parts that contact groundwater or soil have no natural or synthetic components that could absorb and retain most water- or soil-borne organic contaminants. Prior to removal from the work site, potential contaminated soil will be scraped or brushed from the exterior surfaces. The drill rig and all downhole equipment such as augers, split spoon and any other large equipment in the exclusion zone will be steam cleaned. All heavy equipments to be used by the RA Subcontractor for construction of the groundwater treatment facility will be pressure washed before leaving the Site. Heavy equipment used during construction of groundwater treatment system will not come in contact with contaminant soil/groundwater and therefore, containment of the wash water is not required. ( ) Not Needed
Containment and Disposal Method Decontamination derived wastes will be containerized treated/disposed of by the IDW Subcontractor.	Containment and Disposal Method Decontamination derived wastes will be containerized treated/disposed of by the IDW Subcontractor.	Containment and Disposal Method Decontamination derived wastes generated from drilling activities will be containerized treated/disposed of by the IDW Subcontractor.

ROLES AND RESPSONSIBILITIES:

Project Engineer: Mr. Muzaffar Rahmani, is responsible for all project tasks under the supervision of the Site Manger, Mr. Thomas Mathew. Mr. Rahmani is responsible for coordinating all work with the Drilling, IDW and RA Subcontractors and the Resident Engineering/ H&S Representatives.

Corporate Health and Safety Officer (HSO): Mr. Shawn Oliveira, will be responsible for the review of this project-specific Health and Safety Plan (HASP) that governs CDM's field activities.

Resident Engineering and Health and Safety Representatives: Mr. Frank Robinson, is responsible for ensuring that the protocols specified in this Health and Safety Plan (HASP) are followed during the field activities under the direction of the H&S Coordinator and will ensure that current copies of certificates, the HASP, and the CDM Health and Safety Manual are maintained at the Site. Mr. Roberson will oversee the installation of extraction and monitoring wells, aquifer testing, IDW management, and construction activities performed by the RA Subcontractor.

H&S Coordinator (HSC): Ms. Jeniffer Oxford, is responsible for overseeing health and safety on this project. Ms. Oxford will coordinate with the Project/Resident Engineer regarding the status of construction health and safety activities and will verify that all EPA and CDM health and safety requirements are met.

Scientist: Mr. Sean O'Hare, will assist in the collection, preservation, and shipping of groundwater samples and is responsible for ensuring that the protocols specified in the HASP are followed during the groundwater sampling program.

Drilling Subcontractor: The Drilling Subcontractor will be responsible for installation of extraction and monitoring wells and the operation of a temporary treatment system. They will be responsible for inspecting and certifying the safety of their equipment on a daily basis.

IDW Subcontractor: The IDW Subcontractor will be responsible for sampling and disposal of IDW. All IDW disposal will be completed in accordance with their approved H&S plan.

RA Subcontractor: The RA Subcontractor will be responsible for performing all construction, treatment, O&M, and monitoring activities. The RA Subcontractor's H&S personnel will be outlined in the RA Subcontractor's H&S Plan.

PRE-ENTRY BRIEFING AND DAILY SAFETY MEETING TOPICS

Drilling, Aquifer Testing, IDW Management & Sampling

Site background, contaminant levels and exposure symptoms
PPE requirements for today
Buddy system and communication plan
Emergency response
Daily tasks and associated risks; Hazard control
Engineering controls to address site related activities
Injury and incident reporting
Heat stress (weather forecast/conditions)

Groundwater Treatment System Construction

Briefing and daily safety meetings will be conducted by the RA Subcontractor. The briefing and meeting agendas will be determined by the RA Subcontractor and approved by CDM. CDM personnel will attend the RA Subcontractor's briefing and daily safety meetings.

HEAT AND COLD STRESS MONITORING

See Sections 16.13 and 16.14 in Appendix B.

MEDICAL MONITORING

Medical monitoring for CDM field staff are as per OSHA standards 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f). All on-site staff will be cleared by the Health Resources physician for respirator use. Copies of medical certificates will be kept on-site.

TRAINING REQUIREMENTS

All CDM staff shall review this HASP. The Site Manager, HSC, Project/ Resident Engineer, and Resident Engineering Representatives will also review the RA Subcontractor's H&S Plan
HAZWOPER 40-hour - all on-site CDM staff
8-hour refresher - all on-site CDM staff
Supervisor HAZWOPER training (HSC and Resident Engineering Representative; at least one CDM personnel onsite for a given event)
10- hour OSHA construction training (Resident Engineering Representative)
Fit testing
One onsite personnel must have CPR/First Aid Training (For construction of groundwater treatment system activity, this requirement may be fulfilled by RA Subcontractor personnel)
Certificates will be kept on-site

EMERGENCY EQUIPMENT

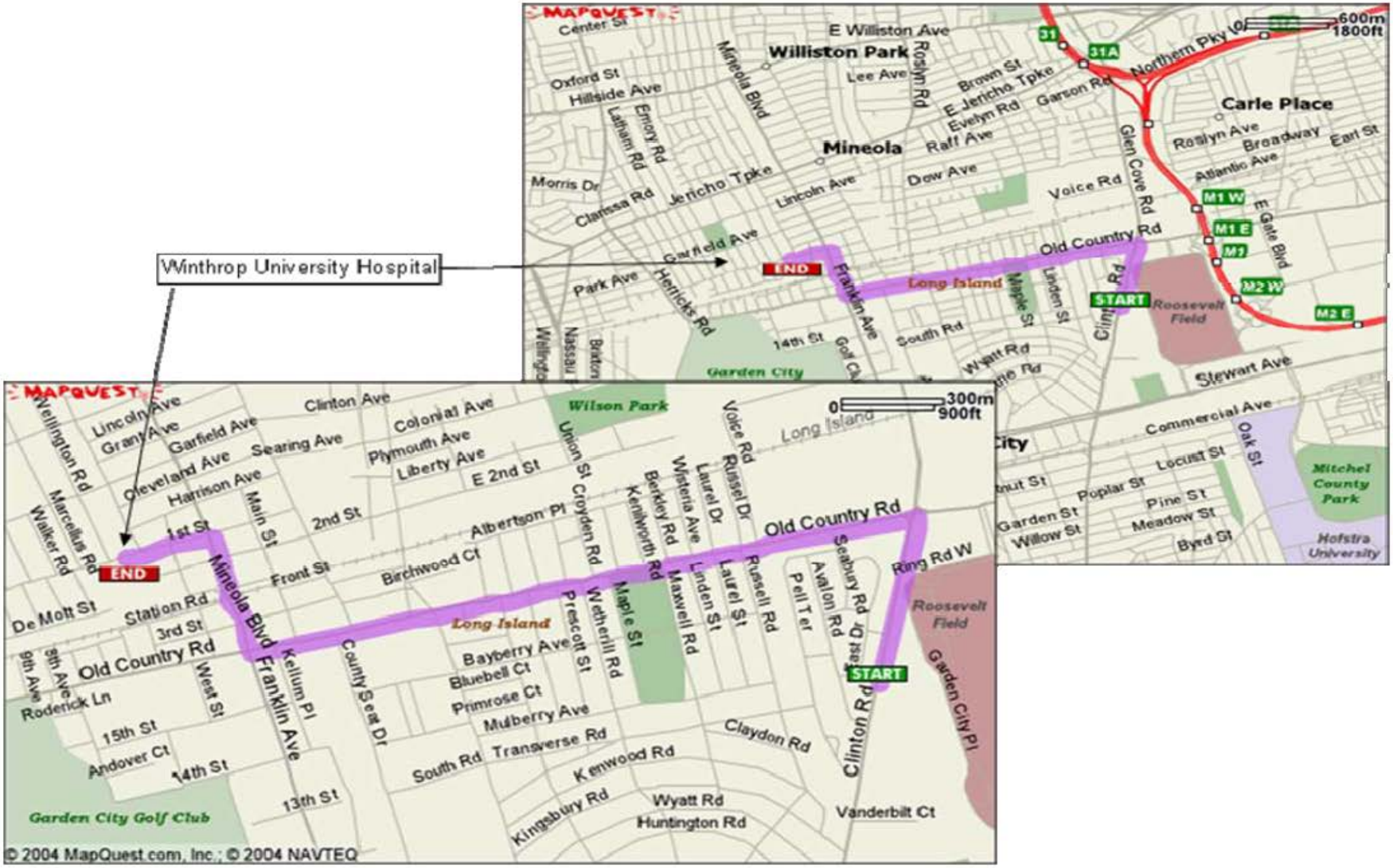
Fire extinguisher (type ABC)
First aid kit
Eyewash

All equipment will be located either in the site vehicle or in the work zone.

SITE HEALTH AND SAFETY PLAN FORM			CDM FEDERAL PROGRAMS CORPORATION		
EMERGENCY CONTACTS			EMERGENCY CONTACTS	NAME	PHONE
Site Telephone	To be determined		Health and Safety Officer	Shawn Oliveira	(406) 293-8595
EPA Release Report No.	800-424-8802		Site Manager	Thomas Mathew	(732) 590 4638
CDM 24-Hour Emergency	406-293-8595/406-293-1547	Shawn Oliveira Cell	Health & Safety Coordinator	Jeniffer Oxford	(212) 377-4536
Facility Management			Site Health & Safety Representative	Frank Robinson	site phone will be provided
Other (specify)			Client Contact	Caroline Kwan	(212) 637-4275
CHEMTREC Emergency	800/424-9300		Project Engineer	Muzaffar Rahmani	(732) 590-4727
			Fire Department	Garden City	(516) 746-1301 or 911
			Police Department	Port Jefferson Station	(516) 742-1211 or 911
CONTINGENCY PLANS Summarize below:			Health Services	Nassau County	(516) 571-3410
Evacuate site if any unexpected hazardous conditions are encountered. If staff observe hazards for which they have not been prepared, they will withdraw from the area and call CDM Federal Health & Safety Officer, Shawn Oliveira. Solo CDM representatives will not enter or remain in an area unless accompanied by client or facility personnel. Without regard to monitoring instrument reading, CDM personnel will leave site and upgrade their level of protection if they experience nausea or dizziness.			State Spill Number	New York	1-800-342-9296
			Poison Control Center	Nationwide	1-800-222-1222
			Occupational Physician	Dr. Jerry Berke	1-800-350-4511
In the event of an emergency, all employees will evacuate the area and meet adjacent to the CDM office trailer.			MEDICAL EMERGENCY		
			Hospital Name: Winthrop University Hospital		516-663-0333
			Hospital Address: 259 1st street,		
HEALTH AND SAFETY PLAN APPROVALS			Mineola, NY		
Prepared by: Muzaffar Ali Rahmani	Date: April 2, 2010		Name of 24-Hour Ambulance:		911
HSO Signature: 	Date: 4/2/2010		Route to Hospital (See next page for map) 1. Take Clinton Road North 2. Turn left onto Old Country Road, travel 1.2 miles 3. Turn right onto Franklin Avenue/Mineola Boulevard. Travel approximately 4 blocks 4. Turn left onto 1st street. The hospital is 2 ½ blocks down (see attached map).		
			Distance to Hospital: Approximately 2 miles		Page 12 of 14

SITE HEALTH AND SAFETY PLAN FORM	CDM FEDERAL PROGRAMS CORPORATION

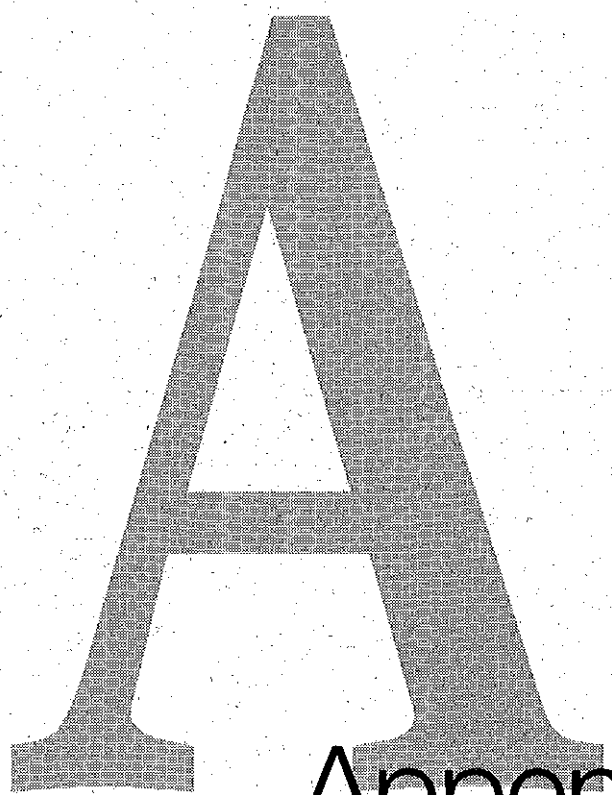
HOSPITAL ROUTE MAP



SITE HEALTH AND SAFETY PLAN FORM		CDM FEDERAL PROGRAMS CORPORATION

The following personnel have read and fully understand the contents of this Site Health and Safety Plan and further agree to all requirements contained herein.

Name	Affiliation	Date	Signature



Appendix A

APPENDIX A
ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS

[1] AHA No.: 3320-023-01	
[2] Work Location: Garden City, Nassau County, New York	
[3] Task Title: Remedial Action	
[4] Work Phase: **Remedial Action**	**[5] List Work Groups Needed for Each Phase**
A. Drilling, well installation, aquifer testing, and IDW management and disposal	**A. Field geologists, drillers, environmental scientists, Health and Safety Representative, and IDW personnel**
B. Site visit, inspections and oversight of RA Subcontractor during construction of groundwater treatment plant	**B. Project Manager and Project Engineer, Resident Engineer and Health and Safety Representative, and RA personnel**
C. Water level collection, monitoring well sampling, continuous water level measurements	**C. Environmental Scientists**
This AHA shall be reviewed annually or as requested by the workers, supervisors, and/or safety representative	

[6] Activity Steps	**[7] Work Groups**	**[8] Hazards**	**[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)**
General (A, B, C)	All	Motor Vehicles/Traffic Safety	• Safety officer will include training discussions during initial kick off meeting to emphasis safe driving behaviors. • Workers shall observe site speeding limits and traffic signs • Defensive driving habits and exhibition of driving courtesy will be encouraged
General (A, B, and C) Site Visit; Drilling, Well installation and testing; Inspections, Oversight of RA Subcontractor during construction of treatment plant; groundwater sampling.	Project Manager and Project Engineer, Field Geologist, Resident Engineer, Environmental Scientists, Health and Safety Representative,	Site access control	• All work areas will be clearly marked with flags and warning signs • Visitors must report to trailer, Site Health and Safety Officer, or Field Team Leader upon arrival.
		Housekeeping – slips/trips/falls	• All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. • Running is prohibited. • Ladders to be inspected before climbing.

ACTIVITY HAZARD ANALYSIS

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)
General (A, B, and C) Site Visit; Drilling, Well installation and testing; Inspections, Oversight of RA Subcontractor during construction of treatment plant; groundwater sampling.	Project Manager and Project Engineer, Field Geologist, Resident Engineer, environmental scientists as required, Health and Safety Representative,	Eye injury	• Safety glasses will be used as required. Face shields will be used when a splash hazard exists. • Welding shield is required for workers performing welding and cutting • At least one eye wash station will be available near primary work area.
		Foot injury	• Leather steel-toes boots will be required.
		Hearing loss	• Hearing protection will be required during hammering operations.
		Hand injury	• Gloves will be worn during routine drilling activities. • Keep hands away from rotating augers, the hammer, and all other moving parts.
		Head injury	• Hard hats will be required when overhead hazard exists • Hard hats will not be required during site set up, but will be required once the mast of rig has been raised.
		Unauthorized operation	• Only trained and authorized personnel will operate and/or assist in operating drilling/heavy equipment. • Operators must comply will all applicable state certifications.
		Slips/trips/falls	• Slippery conditions will be avoided. • Keep pathways clear of objects and electrical wires. Avoid working on plastic sheeting. • Equipment will be stored away safely if not in use. • Exercise good housekeeping practices • Use mats on walkways where feasible to avoid wet areas
		Chemical exposure (site contaminants and operational chemicals)	• Use PPE as required by HASP • Air monitoring to be performed by CDM and RA Subcontractor • Chemical containers to be properly labeled and stored. • CDM will perform daily inspection of storage practices and integrity of containers.

ACTIVITY HAZARD ANALYSIS

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)
A and B Drilling, Well installation and testing; Inspections, Oversight of RA Subcontractor during construction of treatment plant.	Project Manager and Project Engineer, Field Geologist, Resident Engineer, Environmental Scientists, Health and Safety Representative.	Crushing injuries	• Drill rigs and drill bit stabilizer will be properly transported by a rack, the rig, or utility trailer. • If transported on a trailer, the rods or stabilizers will be held securely in place. • If feasible, all vehicles and wheeled equipment will have chocks placed under the wheels to prevent rolling.
		Back Injuries	• Employees will use proper lifting techniques: 1. Bend at knees and grip object with whole hand 2. Keep back as straight and vertical as possible 3. Center body weight over feet 4. Arms and elbows kept close to the body 5. Heavy or large objects shall be carried by two people 6. Ensure pathways are clear
		Rig/equipment damage	• Wire cables will be inspected daily. Cables with broken strands, weak spots, kinking, or mashed areas will be replaced prior to use.
		Fire prevention	• Each drill rig and heavy construction equipment will contain at least one ABC type fire extinguisher. • Fire extinguishers will be fully charged and inspected weekly by Subcontractor and documented on the daily safety inspection report • Flammable liquids will be stored in appropriate containers. • Flammable liquids to be kept away from ignition sources. • Flammable liquids to be used and stored only in areas with good ventilation • Compressed gases cylinders shall never be rolled or dragged; shall be inspected prior to beginning work; stored in cool, dry well ventilation areas free from ignition sources; not stored with other flammable materials; kept in an upright position

ACTIVITY HAZARD ANALYSIS

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)
A and B Drilling, Well installation and testing; Inspections, Oversight of RA Subcontractor during construction of treatment plant.	Project Manager and Project Engineer, Field Geologist, Resident Engineer, Environmental Scientists, Health and Safety Representative.	Severe weather	• Construction activities will stop when rain interferes with the safety of the operators. • Construction activities will stop during lightning. • Operators, crew, and other support personnel will move out of the exclusion zone and take shelter in other vehicles.
		Power lines/underground utilities	• Ensure that there are not any power lines or underground utilities prior to drilling and excavation activities. • If work is near an overhead line, care will be taken to ensure there is sufficient clearance with equipment. • While working near power lines, drill rods will not be leaned against the mast. • A minimum of 10 feet must be maintained between mechanical equipment and energized overhead power lines, otherwise lines must be deactivated or an insulating barrier shall be erected. • If the drill bit or excavator encounters anything hard, drilling will stop and the resident engineering representative will be notified. • Interior borings – meet with facility manager to also clear building drains.
		Equipment Inspection	• Prior to use, all equipment will be inspected by health and safety representative. • Prior to use all drill rigs and heavy construction equipment will be inspected by health and safety and the resident engineer or designee. • All rigs and related equipment will be scanned in by the resident engineer or field operator prior to use. • Drill rigs and support equipment will be inspected daily and documented by the equipment operator.

ACTIVITY HAZARD ANALYSIS

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)
A Drilling, Well installation and testing.	Field Geologist, Drilling crew, Environmental Scientist	Drill rig failure	• The mast and cables must be able to support all equipment and drill rods. • Wire cables must be maintained in good condition, free from kinks or broken strands. • All rotating shafts, pulleys or chains must be covered with protective guards. • All drill rigs must be equipped with an emergency kill switch, which is readily accessible to personnel at the rear of the rig. All personnel on the site will know the location of the kill switch and how to use it.
		Water tanks	• All water tanks must be securely fastened to the truck frame. • Water tanks should be constructed of materials with adequate side strength, baffled to prevent the sloshing of water side to side, and must have lids with gaskets to prevent water loss.
B Inspections, Oversight of RA Subcontractor during construction of treatment plant.	Project Manager and Project Engineer, Resident Engineer, Health and Safety Representative.	Dust	• Dust monitoring to be performed by RA Subcontractor • Work to be performed in a manner that minimizes dust generation • Dust suppression methods to be applied if dust levels become elevated
		Hot Work	• All personnel to be protected from flashes, sparks, molten metal and slag • All equipment to be inspected daily by the operator. • Cutting shall not be performed in presence of explosive atmosphere (monitored by combustible gas indicator) or within 50 feet from combustible materials

ACTIVITY HAZARD ANALYSIS

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)
B Inspections, Oversight of RA Subcontractor during construction of treatment plant.	Project Manager and Project Engineer, Resident Engineer, Health and Safety Representative.	Cranes	• Loads shall not be listed until personnel are clear of the load and personnel shall be kept clear. • Hoists shall be centered before lifting. • Crane loads should be kept vertical. • Loads shall be properly seated in the saddle. • Avoid swinging load. • Keep load as close to floor as possible while clearing obstructions.
		Power Tools	• Tools shall be inspected and maintained in accordance the manufacturer's instructions and recommendations. • Tools designed to accommodate guards will be equipped with the guards when in use • All electrical equipment and extension cords shall be protected with a ground fault circuit interrupter.
		Hazardous Energy	• Lockout/tagout procedures are to be implemented.
		Trenching and excavation (also see underground utilities)	• For excavations greater than 4 feet below ground surface, side-walls shall be sloped or shoring shall be used. • Daily inspections shall be performed • All spoils shall be placed at least 2 feet from the edge of the excavation. • Appropriate barriers will be erected at perimeter of excavation • Sufficient means of entry and egress shall be provided for excavations greater than 4 feet below ground surface
		Traffic	• Traffic control shall be performed in accordance with the Site Management Plan

ACTIVITY HAZARD ANALYSIS

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational, Documents, PPE, Qualifications)
B Inspections, Oversight of RA Subcontractor during construction of treatment plant.	Project Manager and Project Engineer, Resident Engineer, Health and Safety Representative.	Power lines/underground utilities	• Ensure that there are not any power lines or underground utilities prior to drilling and excavation activities. • If work is near an overhead line, care will be taken to ensure there is clearance with equipment. • While working near power lines, drill rods will not be leaned against the mast. • A minimum of 10 feet must be maintained between mechanical equipment and energized overhead power lines, otherwise lines must be deactivated or an insulating barrier shall be erected. • If the drill bit or excavator encounters anything hard, drilling will stop and the resident engineering representative will be notified. • Interior borings – meet with facility manager to also clear building drains.
General (A, B, and C) Site Visit; Drilling, Well installation and testing; Inspections, Oversight of RA Subcontractor during construction of treatment plant; groundwater sampling.	Project Manager and Project Engineer, Field Geologist, Resident Engineer, environmental scientists as required, Health and Safety Representative,	Bloodborne pathogens	• Use PPE to prevent contact with blood and body fluids
		Insects, snakes, and poisonous vegetation	• Avoid animal nesting areas and poisonous vegetation. • Use insect repellant. • Be alert for insect bites.

ACTIVITY HAZARD ANALYSIS

[10] Attachments:

Document Type	Document Number	Applies to Work Group	For Work Step(s)/Phase(s)
Comments:			

[11] References:

Document Type	Document Number	Applies to Work Group	For Work Step(s)/Phase(s)
CDM Health and Safety Program Manual	NA (dated October 2006)	All	All
Old Roosevelt Field Health and Safety Plan	NA (dated April 2010)	All	All

	[12] Subcontractor Approvals	a. Print Name	b. Signature	c. Date
1	Environmental, Safety, and Health			
2	Site Supervisor			

ACTIVITY HAZARD ANALYSIS

[13] Change Summary			

[14] Subcontractor Approvals		a. Print Name	b. Signature	c. Date
1	Environmental, Safety, and Health			
2	Site Supervisor			

ACTIVITY HAZARD ANALYSIS

PRE-JOB BRIEFING ATTENDANCE

AHA No: 3320-023-01	Job Title: AHA for RA Field Activities	Date:
Field Team Leader	Performer Organization:	Time:
I agree to work within the scope of work and follow the work controls described in the briefing.		
Signature	**Badge No. or SSN**	**Organization**

Appendix B

APPENDIX B
CDM HEALTH AND SAFETY GUIDELINES

Hearing Conservation
Housekeeping
Manual Material Handling
Fall Protection
Heat Stress
Cold Stress
Working Around Heavy Equipment
Safety Working Around Drill Rigs
Hazardous Waste Site Controls
Decontamination at Hazardous Waste Sites
Traffic and Work Zone Safety
Cell Phone Safety

Section 15
Hearing Conservation

15.1 Purpose and Scope

The purpose of this section is to prevent permanent and temporary occupational hearing loss that results from overexposure to noise. This section is applicable to all CDM employees and to all equipment and property used by CDM.

15.2 Definitions

Action Level - An exposure to an 8-hour time-weighted average of 85 decibels measured with a dosimeter or sound-level meter on the A-scale at slow response; or equivalently, a dose of 50 percent measured as per Subsection 15.5.5. The action level is the criterion for instituting noise surveys and employee participation in the audio metric testing program.

Administrative Control - Any procedure that limits noise exposure by control of work schedules.

Audiogram - A chart, graph, or table that results from an audiometric test. An audiogram shows an individual's hearing threshold level as a function of frequency (Hz).

Audiologist - A professional who specializes in the study and rehabilitation of hearing and who is certified by the American Speech, Hearing, and Language Association or licensed by a state board of examiners.

Audiometer - An electronic instrument that measures hearing threshold levels and conforms to the requirements and specifications of the current ANSI Standard S3.6.

Baseline Audiogram - An audiogram against which future audiograms are compared. It may also be described as a reference, pre-placement, pre-assignment, or entrance audiogram.

Biological "Functional" Calibration Check - An audiometric test that uses one or more individuals with known, stable hearing levels to check proper functioning and stability of an audiometer and to identify any unwanted or distracting sounds.

Cut-Off Level - All sound levels at or above the cut-off level are averaged into the calculations that relate to noise exposure. All sound levels below the cut-off level are not included.

Deafness: The condition in which the average hearing threshold level for pure tones at 500; 1,000; 2,000; and 3,000 Hz (frequencies used for speech) is at least 93 decibels (reference ANSI S3.6-1969). This is generally accepted as representing a 100 percent hearing handicap for normal speech.

Decibel (dB) - A unit of measurement of sound-pressure level. The decibel level of a sound is related to the logarithm of the ratio of sound pressure to a reference pressure. The dB has meaning only when the reference is known. The internationally accepted reference pressure used in acoustics is 20 micropascals.

Decibels, A-Weighted (dBA) - A sound level reading in decibels made on the A-weighting network of a sound-level meter at slow response.

Decibels, Peak (dBP) - A unit used to express peak sound-pressure level of impulse noise.

Dose Criterion Sound Level - The average sound level at a given dose criterion length for which the dose represents 100 percent of the allowable exposure. The Federal Occupational Safety and Health Administration (Fed-OSHA) requires a dose criterion sound level of 90 dBA for an exposure duration of 8 hours. ARC has a dose criterion level of 85 dBA for an 8-hour exposure, per Section 29.6.

Dose Criterion Length - The permissible exposure duration (in hours) for a given dose criterion sound level for which the dose represents 100 percent of the allowable exposure.

Eight-Hour Dose - The actual dose (as a percentage) accumulated over the duration of the work shift and based on a regulations defined criterion level and criterion length.

Engineering Control - Any mechanical device, physical barrier, enclosure, or other design procedure that reduces the sound level at the source of noise generation or along the path of propagation of the noise to the individual. This does not include protection equipment such as earmuffs, plugs, or administrative controls.

Hazardous Noise - Noise generated by an operation, process, or procedure that is of sufficient duration and intensity to be capable of producing a permanent loss of hearing in an unprotected person. Generally, this is interpreted as persistent noise levels equal to or greater than 85 dBA or combinations of higher intensities for durations shorter than 8 hours.

Hertz (Hz) - A unit of measurement of frequency that is numerically equal to cycles per second.

Impulsive or Impact Noise - Variations in noise levels that involve peaks of intensity that occur at intervals of greater than 1 second. If the noise peaks occur at intervals of 1 second or less, the noise is considered continuous.

Lav - The average sound level (in dBA) computed for a chosen averaging time duration.

Lav (80) - The average sound level (in dBA) computed for a chosen averaging time duration, using an 80-dBA cut-off level. The 80-dBA cut-off level is used by Fed-OSHA for hearing conservation compliance requirements.

Manager - A broad term that can refer to managers, program and project managers, direct managers, site managers, supervisors, department heads, group heads, branch chiefs, owners, and/or persons that operate in a management capacity or supervisory roll with respect to affected employees.

Medical Pathology - A disorder or disease. For the purposes of this chapter, a condition or disease that affects the ear and should be treated by a physician specialist.

Monitoring Audiogram - An audiometric test obtained at least annually to detect shifts in an individual's threshold of hearing by comparison to the baseline audiogram.

Noise - Unwanted sound.

Noise Dose - A measure of cumulative noise exposure over a stated period, which takes into account both the intensity of the sound and the duration of the exposure.

Noise Dosimeter - An electronic instrument that integrates cumulative noise exposure over time and directly indicates a noise dose.

Noise Hazard Area - Any work area with a noise level of 85 dBA or greater.

Otolaryngologist - A physician who specializes in the diagnosis and treatment of disorders of the ear, nose, and throat.

Representative Exposure - The measurements of an employee's noise dose, or an 8-hour time-weighted average sound level that a qualified person deems representative of the exposure of other employees in that work area or job classification.

Standard Threshold Shift (STS) - An average hearing threshold shift of 10 dB or more at 2,000; 3,000; and 4,000 Hz in either ear. A threshold shift can be temporary or permanent. Temporary threshold shift is a change in hearing threshold, primarily due to exposure to high-intensity noise that is usually recovered in 14 to 72 hours. Any loss that remains after an adequate recovery period is termed permanent threshold shift.

Sound-Pressure Level - The term used to identify a sound measurement (expressed in decibels) obtained with a sound-level meter that has a flat frequency response. This is mathematically equivalent to 20 times the common logarithm of the ratio of the measured A-weighted sound pressure to the standard reference pressure of 20 micropascals (measured in decibels). For use with this standard, slow time response is required in accordance with the current ANSI.S1.4.

Sound-Level Meter (SLM) - An electronic instrument for the measurement of sound levels that conforms to the requirements for a Type II sound-level meter as specified in ANSI S1.4-1971.

Time-Weighted Average (TWA) Sound Level - The sound level that, if constant over an 8-hour workday exposure, would result in the same noise dose as is measured.

TWA (80) - The time-weighted average level that corresponds to a noise dose computed with an 80-dBA cut-off level.

15.3 Responsibilities

Health and Safety Manager

- Develops and implements a hearing conservation program.
- Provides guidance to employees (and their managers) whose jobs expose them to hazardous noise levels.
- Provides periodic noise monitoring when necessary.

- Periodically reviews the hearing conservation program for compliance standards.
- Provides employees access to noise survey/dosimetry records.
- Coordinates the medical surveillance program that includes baseline and annual audiograms.
- Recommends the selection of hearing protection and specifies performance (attenuation) requirements.
- Notifies management of all areas that have been designated as noise hazard areas.

Health and Safety Coordinators

- Reports suspected hazardous noise areas to the HSM so that noise monitoring can be conducted.
- Ensures that employees who work in designated noise hazard areas (or are otherwise exposed to hazardous noise) receive pre-placement, annual, and termination audiograms.
- Ensures that employees in high-noise areas use hearing protection devices.
- Notifies the HSM of any changes in operations that require noise determinations or evaluations.
- Ensures that hearing protection devices that have been approved by the HSM are available for use by employees.
- Ensures that employees who participate in the Hearing Conservation Program attend required training and provides documentation of such training to the HSM.
- Ensures that caution signs are posted in designated noise hazard areas.
- Ensures the design and application of engineering controls recommended by the HSM that are needed to reduce noise exposures to acceptable limits or to the maximum extent feasible.

Employees

Responsibilities of employees who work in high noise areas are:

- Wear and maintain hearing protection as required by the HSC
- Cooperate with H&S personnel in activities undertaken to evaluate hazardous noise
- Notify direct or project manager or HSC of areas, operations, or equipment that may produce hazardous noise
- Attend hearing conservation training when necessary
- Participate in the medical surveillance program

15.4 Noise Exposure Limits

Protection against the effects of noise exposure shall be provided when sound levels exceed those in Tables 15-1 and 15-2 below. Noise exposure limits are generally applied as an 8-hour exposure limit of 85 dBA. For exposures of shorter or longer durations, the exposure limit may be adjusted as indicated in the table. Hearing conservation program elements are expected to be implemented whenever employee noise exposures equal or exceed an 8-hour time-weighted average of 80 dBA measured as per Subsection 15.5.5. Hearing conservation program elements include exposure monitoring, audiometric testing, medical monitoring, and training. The dose criterion of 80 dBA for an 8-hour exposure is referred to as the action level.

Table 15-1
Continuous Noise Permissible Exposure Limits

Duration (Hours)	*Sound Level (dBA)**
16	80
8	85
4	90
2	95
1	100
0.5	105
0.25	110
0.125 or less	115

*Measured on the A-scale of a standard sound-level meter set at slow response.

Table 15-2
Impulse Noise Permissible Exposure Limits

*Sound Level (dBP)**	*Permitted Impulses/Day*
140	100
130	1,000
120	10,000

*Peak sound-pressure level.

15.5 Hearing Protection Methods

15.5.1 Engineering Controls

Where feasible, facilities and equipment will be procured, designed, operated, and/or modified in such a manner as to prevent employee exposure to continuous noise levels above 85 dBA over an 8-hour TWA or impulsive noise above 125 dBP. Any reduction in employee noise exposure, even if not reduced below 85 dBA, is beneficial. If engineering controls fail to reduce sound levels to within the limits of Section 15, hearing-protective equipment and/or administrative methods of noise-exposure protection must be used.

15.5.2 Personal Hearing Protection

- PPE is to be used only temporarily or if engineering controls are not feasible or practical.

- The HSCs shall enforce the use of earmuffs and/or plugs by employees assigned to work in areas where they will be exposed to continuous noise (without regard to duration of exposure) in excess of 85 dBA or to impulse noise in excess of 140 dB. Disposable earplugs and/or earmuffs will be made available for employee use (if desired) if noise exposures under 85 dBA create a nuisance. Earplugs will be provided for the exclusive use of each employee and will not be traded or shared.

- Hearing protectors must attenuate employee noise exposure to a level of 85 dBA or below. Both earmuffs and plugs are required where noise levels equal or exceed 110 dBA. For employees with standard threshold shift, protectors must attenuate exposure to an 8-hour TWA of 80 dBA. Estimation of the adequacy of hearing-protector attenuation should be performed according to the methods OSHA specifies in 29 CFR 1910.95 App B, Methods for Estimating the Adequacy of Hearing Protector Attenuation.

- If reusable preformed earplugs are used, they will be permanently issued to the employee and fitted to the employee under medical supervision. During fitting, the employee will be instructed in the proper method of insertion, storage, and cleaning of the earplugs. Earplugs will be checked during annual medical examinations.

- Earmuffs will be provided for employees when analysis of noise environments shows that the attenuation provided by earplugs is not sufficient to reduce noise exposures below 85 dBA. The user shall inspect earmuffs on a regular basis.

- Special hearing-protective equipment, such as sound-suppression communication headsets, may be used in noise hazard areas. These devices should be inspected regularly. Sound-suppression headsets may not be used if they have been damaged, altered, or modified in any way that affects the attenuation characteristics. If replacement parts (such as ear cup seals) are available, the headsets may be repaired and reused. If sound-suppression headsets are not permanently issued to employees, such equipment must be cleaned and sanitized before reissuance.

15.5.3 Administrative Controls

If hearing-protective equipment or engineering controls are not sufficient to attenuate noise to less than 85 dBA, the duration of time spent in the noise hazard area shall be limited so as not to exceed the exposure limits specified in Section 15.4.

15.5.4 Noise Monitoring

- Measurement of potentially hazardous sound levels shall be conducted when any information, observation, or calculation suggests that an employee could be exposed to a noise level in excess of an 8-hour TWA. This includes, but is not limited to, times when representative exposures need to be documented, when employees complain of excessive noise, or when it is difficult to understand a normal conversation if the speaker and the listener face each other at a distance of 2 feet. Any new equipment, operation, job, or procedure with the potential for creating hazardous noise should be evaluated with regard to noise emissions before startup. All continuous, intermittent, and impulsive sound levels from 80 to 130 dBA will be integrated into the noise measurements.

- Both noise dosimetry and area monitoring will be repeated periodically, or whenever any changes to facilities, equipment, work practices, procedures, or noise-control measures alter potential noise exposures.

- Employees and/or their representatives will be provided an opportunity to observe noise dosimetry and area monitoring activities.

- Areas determined to have noise levels at or above 85 dBA must be posted as noise hazard areas.

- Affected employees (employees whose exposures have been determined to exceed the action level) shall be notified of the results of noise monitoring.

15.5.5 Noise-Measurement Methods

- Sound-level meters must meet Type II requirements of ANSI S1.4 and must be capable of measuring sound in the range of 80 to 130 dBA.

- Noise dosimeters must meet Class 2A-90/80-5 requirements of ANSI S1.25 and be capable of integrating sound levels of 80 dB and above.

- Employee noise doses may be ascertained by using either a noise dosimeter or sound-level meter. If a sound-level meter is used to estimate an employee's dose, the noise survey will include a time and motion study to document the variations in the employee's noise exposure during the working shift. If an employee moves about or noise intensity fluctuates over time, noise exposure is more accurately estimated by personal dosimetry. Regardless of the method chosen, a sufficient number of readings/measurements will be made to accurately reflect noise exposure.

- Employee exposure measurements will be made in such a manner as to accurately represent the actual exposure to noise.

  - When using a noise dosimeter to determine an employee's noise exposure, the microphone will be attached to the employee in the area of the employee's shoulder.

  - When using a sound-level meter, the microphone should be positioned not less than 2 inches nor more than 2 feet from the employee's ear.

  - Measurements will be made with the employee at his/her regular work stations(s).

- Before and after each use, dosimeters and sound-level meters will be calibrated using acoustical calibrators to verify the accuracy of the measuring equipment.

  - If any sound-level meter or noise dosimeter is dropped, or if the microphone receives a sharp impact, a calibration check shall be performed to ensure that it is still working properly before taking additional measurements.

  - Sound-level meters and noise dosimeters that are not working properly or are out of calibration shall not be used to determine an employee's noise exposure.

15.6 Medical Surveillance Program

Program Participation

- Whenever an employee is routinely occupationally exposed to continuous noise at or above the action level or to impact or impulsive noise in excess of the limits specified in Section 15.4, the employee shall be enrolled in a medical surveillance program. Employee noise exposure shall be determined without regard to any sound attenuation provided by the use of hearing protectors.

- Each employee placed in a job that required participation in a medical surveillance program shall undergo a physical examination before being assigned to duties that involve exposure to high-intensity noise. The examination shall include a baseline audiogram, a medical examination to determine any preexisting medical pathology of the ear, and a work history to document past noise exposures. The history shall include a detailed review of past work histories and possible occupational and nonoccupational noise exposures.

- When it is discovered that employees have been working where they encounter hazardous noise or incur exposures that exceed the action level and have not had a physical examination, one shall be conducted within 30 days. The audiogram must follow at least 14 hours of no known exposure to sound levels in excess of 80 dBA. This interval should be sufficient to allow recovery from noise-induced temporary threshold shift.

- Personnel who suffer from acute diseases of the ear shall not be placed in hazardous noise areas until the condition has abated, particularly if such diseases preclude the wearing of hearing protectors, cause hearing impairment, or produce tinnitus.

- All employees who are participants in the medical surveillance program must receive an annual audiogram.

- All CDM employees who have participated in the medical surveillance program shall receive a final audiometric examination before termination of employment with CDM, job changes within the installation that would alter noise exposure, transfer to another installation, or retirement.

15.7 Audiometric Testing

15.7.1 Medical Personnel

Medical personnel who perform audiometric tests must be qualified, trained, and knowledgeable in operating equipment used and be under the supervision of an audiologist or physician. If manual audiometers are used, the Council for Accreditation in Occupational Hearing Conservation must certify qualifications of personnel who operate the audiometer. Hearing threshold levels will be determined by audiometers calibrated to zero reference levels of the ANSI S3.6 standard for audiometers.

15.7.2 Pure Tone, Air Conduction Testing

Pure tone, air conduction testing shall be conducted at test frequencies of 500; 1,000; 2,000; 3,000; 4,000; and 6,000 Hz for each ear. Audiometric test equipment shall meet the specification, maintenance, and use requirements of ANSI S3.6. Where a pulsed-tone, self-recording audiometer is used, it will also meet the requirements of 29 CFR 1910.95, Table 3.

- A listening check shall be performed daily before use to ensure that the audiometer is free from distorted or unwanted sounds.

- A functional check shall be performed each day either by using an "acoustical ear" calibrator (dBA sound-level meter with 9A Type Earphone Coupler) or by testing an individual with a known and stable hearing baseline (a "biological check"). A record will be kept of the daily checks. Deviations of 5 dB or more require an acoustical calibration test.

- An acoustical calibration test (using a sound-level meter, octave-band filter set, and a National Bureau of Standards 9A Coupler) shall be performed at least annually (semi-annually for self-recording audiometers), or when a functional check indicates a deviation of 5 dB or more. The acoustical calibration tests shall conform to the requirements of 29 CFR 1910.95, Appendix E. Deviations of 10 dB or more will require an exhaustive calibration.

- An exhaustive calibration shall be performed at least every 2 years, or whenever an acoustical calibration test indicates an error of 10 dB or more. The test will meet the criteria of the current ANSI S3.6 guidelines appropriate for the instrument. Following calibration, the front panel of the audiometer shall be labeled with a tag indicating that is has been calibrated to ANSI S3.6 guidelines and the date of the calibration.

- Rooms used for audiometric testing shall not have background sound-pressure levels that exceed those in the table below. Sound-pressure levels for rooms used for audiometric testing must be checked at least every 2 years.

Table 15-3
Maximum Background Sound-Pressure Levels for Audiometric Test Booths

Frequency (Hz)	*Sound-Pressure Level (dBA)*
500	27
1,000	30
2,000	35
4,000	42
8,000	45

- Employees must receive advance written notification of the need to avoid high levels of occupational and nonoccupational noise during the 14 hours immediately preceding an audiometric test. Properly fitted hearing protectors and/or other hearing-protective devices may be used to prevent excessive noise exposures during this period.

- A physician or other qualified person shall compare annual audiograms with the employee's baseline audiogram to determine if it is valid and if a standard threshold shift has occurred. It is desirable to review the employee's audiogram record for patterns of change over time. When determining if a standard threshold shift has occurred, allowances for the effects of aging to the hearing threshold level may be made using the procedure described in 29 CFR 1910.95, Appendix F. Audiograms referenced to ASA-1951 must be converted to ANSI S3.6-1969 before hearing threshold levels can be properly determined (see the table below for conversion).

Table 15-4
Threshold Audiogram Conversion
ASA-1951 to ANSI-1969

Frequency	*dB Difference*
250	15
500	15
1,000	10
2,000	10
3,000	10
4,000	5
6,000	10
8,000	10

  - To convert an ASA-1951 reference threshold audiogram to ANSI-1969, add the difference in values.

  - To convert ANSI-1969 to ASA-1951, subtract the values.

- When evaluation of an audiogram indicates that a standard threshold shift has occurred, a retest shall be scheduled within 30 days to determine if the shift is temporary or permanent. A medical evaluation may be warranted at this time to determine if an acute medical condition is a contributing factor.

- An annual audiogram may be substituted for the baseline when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the audiogram, the hearing threshold shown on the annual audiogram indicates significant improvement over the baseline audiogram.

- The employee will be notified of audiometric testing results in writing within 21 days of determination of a permanent threshold sift. The subcontract health care provider retained by CDM shall notify the employer and employee in writing of determinations of permanent threshold shifts.

15.7.3 Criteria for Referral to an Audiologist

The following are criteria for referral to an audiologist for more comprehensive testing:

- Average hearing threshold level greater than 25 dB at 500; 1,000; and 2,000 Hz.

- Single frequency loss greater than 55 dB at 3,000 Hz; or greater than 30 dB at 500; 1,000; or 2,000 Hz.

- Difference in average hearing threshold level between the better and poorer ear of more than 15 dB at 500; 1,000; and 2,000 Hz; or more than 30 dB at 3,000; 4,000; and 6,000 Hz.
- Reduction in hearing threshold level in either ear from the baseline or previous monitoring audiogram of more than 15 dB at 500; 1,000; or 2,000 Hz; or more than 30 dB at 3,000; 4,000; or 6,000 Hz.
- Variable or inconsistent responses or unusual hearing loss curves.

15.7.4 Conditions that Require Follow-Up Review of Employees with Hearing Illness and Responses

- When a permanent threshold shift is detected, a follow-up review must be conducted.
- An employee who is not currently using hearing protection shall be provided (and fitted as necessary) with hearing protectors and shall be trained in their use.
- The employee shall be provided/refitted with hearing protectors that offer greater sound attenuation, as warranted, if hearing protectors are already in use.
- The employee shall be trained/retrained on the hazardous effects of noise and the need to use hearing protection.
- The employee's work area shall be investigated to determine if work practices or changes in equipment or procedures can be made that will decrease noise hazards or if changes have resulted in an increase in noise hazards.
- The employee shall be reassigned to work in a low-noise area, as necessary, to prevent further hearing impairment. The employee will continue to participate in the hearing conservation program.

15.8 Noise Hazard Warning Signs

Caution signs that clearly indicate a hazard of high noise levels and the requirements to wear hearing protection shall be posted at the entrance(s) to, and the periphery of, noise hazard areas. Decals or placards with similar statements shall be affixed to power tools and machines that produce hazardous noise levels. Signs and decals shall have wording in black letters on a yellow background (refer to Section 15.11 for noise hazard warning sign specifications).

15.9 Employee Training

- Each employee who participates in the hearing conservation program shall receive annual training. The training must include, but not be limited to:
  - An overview of the CDM Hearing conservation program
  - A review of the effects of noise on hearing (including permanent hearing loss)

- Noise control principles
- The purpose, advantages, disadvantages, and attenuation characteristics of various types of ear protectors
- Instruction on selection, fitting, use, and care of hearing protectors
- An explanation of the audiometric testing and its purposes

- Personnel will be encouraged to use hearing protectors when exposed to hazardous noise in nonoccupational settings (e.g., from lawn mowers, firearms, etc.).

15.10 Records Maintenance

- Audiogram and noise-exposure records shall be maintained as a permanent part of employee medical records. If noise-exposure measurement records are representative of the exposures of other employees participating in the hearing conservation program, the range of noise levels and the average noise dose will be made a permanent part of the medical records of the other employee as well.

- In addition to audiometric test data, each medical record will, as a minimum, identify:
  - The audiometric reference level to which the audiometer was calibrated at the time of testing
  - The date of the last calibration of the audiometer
  - The name, social security number, and job classification of the employee tested
  - The employee's most recent noise exposure assessment
  - The date(s) hearing conservation training was received

- Records of the background sound-pressure levels in the audiometric test rooms and data and information concerning calibration and repair of sound-measuring equipment and audiometers (as well as all audiometric test data) will be maintained by CDM's medical consultant in accordance with OSHA and other applicable regulations.

- Accurate records of noise surveys/monitoring, results of the special noise studies, and records of special actions or engineering controls installed to control noise exposures will be maintained for the duration of the affected employee's employment, plus 30 years.

15.11 Signs and Decals

15.11.1 Noise Hazard Warning Sign Specifications

Warning signs must read:

CAUTION

NOISE AREA

MAY CAUSE HEARING LOSS

USE PROPER

HEARING PROTECTION

IN THIS AREA

The lettering is almost always all caps, black, and on a yellow background.

15.11.2 Noise Hazard Warning Decal Specifications

Decals must have a yellow background and black lettering (all caps). The decal must be self-adhesive on the side opposite the written warning. The written warning must read:

CAUTION

NOISY EQUIPMENT MAY CAUSE HEARING LOSS

USE PROPER

HEARING PROTECTION

The word caution is in yellow lettering with a black background superimposed on the yellow background of the label. As shown, the word caution is 2 point sizes larger than the lettering in the rest of the warning.

16.2 Housekeeping

These guidelines are for the establishment and administration of a clean and orderly work environment at field project sites. A continuous housekeeping program strongly tends to prevent accidents. A clean and orderly work environment can be achieved and maintained through ongoing housekeeping efforts undertaken by personnel at all levels. Project managers shall initiate participation in housekeeping activities and good work habits, not only at the end of a work assignment but throughout the evolution of the project.

- To achieve these benefits, the team shall plan the location of equipment and storage facilities to allow the easy flow of personnel, equipment, materials, fire hazards, and to prevent the obstruction of evacuation, fire fighting, or rescue activities.

- Store materials in a manner that facilitates access of material handling equipment and personnel handling limitations. Lack of sufficient workspace and storage capacity leads to the potential for accidents and decreases efficiency.

- Avoid storage of flammable liquids, such as paints and thinners, unless they are required for specific project needs. If needed, such storage shall be within a metal storage cabinet that has been labeled and approved for the storage of flammable liquids.

- Continuously maintain work areas in a neat and orderly manner.

- Containers should be provided for the collection of waste, trash, and other nonhazardous refuse. Investigation-derived waste and other waste materials that are potentially hazardous should be stored and labeled in accordance with project-specific procedures that meet regulatory and client requirements.

- Deploy leads, hoses, and extension cords so they do not present tripping hazards and are not subject to contact with moisture or physical stress. Where possible, they should be hung overhead with nonconductive material and kept away from walkways, doors, stairs, and ladders.

- Protect protruding rebar and anchor bolts and conspicuously mark them.

- Clean small spills that create slip hazards and/or flammability hazards immediately and do not leave them unattended.

- Keep walkways, aisles, stairways, and passageways in a clear and unobstructed condition.

- Prohibit eating and drinking in work areas where there is potential exposure to toxic or hazardous materials. Smoking is limited to designated smoking areas where there is no such exposure.

16.3 Manual Material Handling

CDM employees should follow the work practices outlined below when lifting and carrying heavy objects.

- Test any load they are required to lift and compare its weight, volume, and shape to their lifting abilities. Employees shall not attempt to lift beyond their capacity.
- Obtain assistance in lifting heavy objects. Back belts or back braces may be used if desired; however, many ergonomists do not believe that these devices create a benefit or provide protection.
- When two or more persons are involved in a manual lift, one person should provide direction of the lift.
- When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried.
- When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.
- The right way to lift is easiest and safest. Crouch or squat with the feet close to the object to be lifted, secure good footing, take a firm grip, bend the knees, keep the back vertical, and lift by bending at the knees and using the leg and thigh muscles. Exercise caution when lifting or pulling in an awkward position.
- Employees should avoid twisting or excessive bending when lifting or setting down loads.
- When moving a load horizontally, employees should push the load rather than pull.
- For tasks that require repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.
- When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.

16.7 Fall Protection

CDM employees who visit active construction sites may be exposed to falls. A fall exposure is considered to exist when an employee is within 6 lateral feet of a change in elevation of 6 vertical feet or more. Typical exposures can include:

- Excavations
- Roofs
- Leading edge of a surface (floor)
- Floor openings

All employees should use fall protection 100 percent of the time when exposed to a fall in excess of 6 feet or when required by rules such as those of a client or the owner or operator of a facility. Fall protection may consist of any of the following:

- Guardrails
- Safety nets
- Positioning systems
- Warning systems
- Personal fall arrest systems

Employees should not use fall arrest equipment until they have been properly trained. Fall protection training can be arranged by contacting your division HSM. Project managers and site managers shall ensure fall protection is available and used as required for all employees for whom they are responsible and that employees receive adequate training in the use of the equipment.

The following work practices and guidelines should be considered for protection against falls:

- Before working or walking on a surface, consider the strength and structural integrity of the surface. Can it support employees and any needed equipment or material safely? Employees shall work on those surfaces only when the surfaces have the requisite strength and structural integrity.

- When not protected by any other means of fall protection, such as safety nets or scaffold with proper guardrails, employees shall use full body harnesses, lanyards with double-locking snap hooks, and an adequate anchorage (fall arrest equipment). To achieve 100 percent fall protection, employees may need to use a two-lanyard system and/or vertical or horizontal lifelines, retractable lifelines, or other approved positioning devices.

- Employees shall rig fall arrest equipment so that it minimizes the potential for a fall arrest event or any potential free-fall, lateral swing, or contact with any lower object. Under no circumstances shall fall arrest equipment be rigged so that an employee can free-fall more than 6 feet.

- Anchorage points for fall arrest equipment shall be capable of supporting 5,000 pounds per employee attached. Anchorage points for fall arrest equipment shall be located above the employee's body harness attachment point where practical.

- When vertical lifelines are used, a separate lifeline shall protect each employee. The lifeline shall be properly weighted at the bottom and terminated to preclude a device such as a rope grab from falling off the line.

- Horizontal lifelines should be limited to two persons at one time between supports and maintain a safety factor (strength/requirement) of at least 2.

- Before each use, employees shall visually inspect all fall arrest equipment for cuts, cracks, tears or abrasions, undue stretching, overall deterioration, mildew, operational defects, heat damage, or acid or other corrosion. Equipment showing any defect shall be withdrawn from service. All fall arrest equipment subjected to impacts caused by a free-fall or by testing shall be removed from service. CDM personnel shall use full body harnesses for personal fall protection. Fall protection equipment is available from the field equipment centers.

- Fall arrest equipment should be stored in a cool dry place not subjected to direct sunlight.

- Fall arrest equipment shall not be used for any other purpose, such as towropes or hoist lines.

- Proper guardrails shall be installed on open sides of all walkways and runways where the fall distance exceeds 4 feet. Proper guardrails shall be installed on open sided floors where the fall distance exceeds 6 feet. All floor openings or floor holes shall be protected by guardrails or hole covers. If hole covers are used, they shall be strong enough to support the maximum intended load, secured against displacement, and properly labeled.

- When guardrails are used for fall protection, they shall consist of a top rail, intermediate rail, and toeboard. The top rail shall have a vertical height of 42 inches, the midrail shall be at 21 inches, and the toeboard 4 inches. When wood railings are used, the post shall be of at least 2-inch by 4-inch stock spaced not to exceed 8 feet, the top rail shall be of at least 2-inch by 4-inch stock, and the intermediate rail shall be of at least 1-inch by 6-inch stock. If pipe is used, it shall be at least 1½-inch nominal diameter. If structural steel is used, it shall be of 2-inch by 2-inch by 3/8-inch angles or equivalent. If wire rope is used for railings, it shall have a diameter of at least 2 inches and shall be stretched taut to allow no more than a 3-inch deflection.

- When operating a scissor-lift work platform, the lift shall have guardrails on all open sides, with the door access chains or rails in place.

- Employees operating aerial lifts shall wear a body harness and lanyard attached to the aerial lift. Employees shall not attach the lanyard to an independent structure.

- Employees riding in a crane-suspended work platform shall wear a body harness and lanyard attached to the grab rail of the platform.
- Employees working on or near wall forms or rebar shall wear a body harness lanyard and/or positioning device when exposed to a fall in excess of 6 feet.
- Positioning devices shall be rigged to prevent a free-fall greater than 24 inches.
- Stairs, ladders, or ramps shall be provided for all access ways where there is a change in elevation greater than 19 inches.
- Manila or synthetic rope shall not be used as guardrails.
- Employees shall not stand or sit on guardrails.
- Personal fall arrest systems shall not be attached to guardrail systems.
- If warning lines are used, they should consist of rope, wire, or chain and be flagged at intervals of 6 feet or less with high-visibility material. The lowest point should be no less and 34 inches from the surface, and the highest point should be no more than 39 inches. The warning line should be placed at least 6 feet from the edge.
- Safety net systems should be installed as close to the working surface as practical, but in no case more than 25 feet below the working surface and should extend outward at least 8 to 13 feet depending on the vertical fall distance. Safety nets should be drop-tested after initial installation and at 6-month intervals. The maximum size of net mesh should not exceed 36 square inches nor be longer than 6 inches on any side. Mesh opening should be secure to prevent enlargement.
- Body belts should not be used for personal fall arrest. Full body harnesses are required.

16.13 Heat Stress

CDM employees may be exposed to hazards associated with hot work environments. Factors that contribute to heat exposure include temperature, humidity, PPE radiant heat, sunlight, access to drinking water, exposure duration, and work activity. Individuals vary widely in their susceptibility to heat stress. Factors that may influence individual susceptibility to heat stress include the following:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

The following guidelines should be considered when CDM employees or subcontractors perform work:

- In ambient air temperatures above 80°F
- That involves heavy physical labor in temperatures above 70°F
- In chemical-protective clothing above 70°F

16.13.1 Hazards Associated with Heat Stress

Heat Stroke – Heat stroke is a serious medical emergency and can lead to death if left untreated. It is an acute and dangerous reaction caused by the failure of heat regulating mechanisms of the body. Persons who are elderly, obese, chronically ill, alcoholic, diabetic, or have circulatory system problems are at greater risk.

- Symptoms include red, hot, dry skin; nausea; headache; weakness; dizziness; elevated body temperature (BT); rapid respiration and pulse; coma; or loss of consciousness.

- Treatment for heat stroke:

  - Heat stroke is a serious medical emergency. Emergency medical services (911) should be contacted if heat stroke is suspected.
  - Move the victim to a cool place (shade, air conditioned building, vehicle).
  - Remove heavy clothing.
  - Cool the victim with ice packs, wet towels, or cloth.
  - Keep head and shoulders elevated.
  - Keep victim's airway open, check breathing and pulse.

Heat Exhaustion – A state of exhaustion or weakness caused by loss of fluids through perspiration and inadequate fluid replacement. Severe cases may result in loss of consciousness (fainting). This condition can progress to heat stroke if left untreated.

- Symptoms include:

  - Pale, clammy, moist skin; heavy sweating; and extreme weakness.
  - BT is normal, pulse is weak and rapid, breathing is shallow.
  - The person may have a headache, nausea, or feel dizzy.

- Treatment for heat exhaustion:

  - Remove the victim to a cool location (shade, air conditioned building, or vehicle).
  - Allow the victim to lie down and prop their legs up.
  - Cool the victim with wet towels, cloth, or cold packs.
  - If the victim in not nauseous, they should drink water slowly.
  - If the victim loses consciousness, transport to local medical facility.
  - Continue treatment until symptoms are gone. Consult with CDM medical consultant before returning to work.

Heat Cramps – Heat cramps are a condition that can progress to heat exhaustion or heat stroke. Symptoms include severe cramping of the arms, legs, and abdomen. Treatment includes:

- Removing the victim to a cool location; loosen clothing
- Having the victim slowly drink cool water
- Resting the cramping muscles

Heat Rash – Heat rash is a mild red skin rash in areas where the body is in contact with clothing or protective gear. The area is likely to itch and can be a source of irritation. Treatment includes decreasing the amount of time in protective gear and applying talcum powder to absorb moisture. When possible, wear breathable clothing to prevent a buildup of moisture within the clothing.

16.13.2 Heat Stress Monitoring

Since the susceptibility to heat stress hazards can vary greatly from one individual to another, often the best way to monitor for heat stress is through observing employees and individual physiological monitoring. When working in conditions that have the potential to create heat stress, either heart rate (HR) or BT should be monitored in accordance with the suggested frequency given in Table 16-1 below:

Table 16-1
Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers[a]

Adjusted Temperature[b]	*Normal Work Ensemble[c]*	*Impermeable Ensemble*
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8° to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28.1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (22.5° to 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (T_a adj) by using this equation: T_a adj °F = T_a °F + (13 X % sunshine). Measure air temperature (T_a) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine - no cloud cover and a sharp, distinct shadow; 0 percent sunshine - no shadows).

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

- Heart Rate – HR should be measured by the radial pulse for 30 seconds as early as possible in the initial rest period. On an individual basis, if the HR exceeds 110 beats per minute (BPM), that individual should not return to work until their HR drops below 110 BPM and they are fully recovered. If more than one worker has an HR that exceeds 110 BPM, a work rest regimen or other control measures should be implemented to maintain HRs below 110 BPM.

- Body Temperature – The BT may be measured using a clinical oral thermometer or a clinical ear thermometer. On an individual basis, if the BT exceeds 99.6°F, that individual should not return to work until their BT drops below 99.6°F and they are fully recovered. If more than one worker has a BT in excess of 99.6°F, a work rest regimen or other control measures should be implemented to maintain BTs below 99.6°F.

- Personnel should monitor themselves and each other for the development of symptoms such as sudden fatigue, nausea, dizziness, irritability, malaise, flu-like symptoms, and lightheadedness.

16.13.3 Heat Stress Controls and Prevention

- Develop work/rest regimen to maintain physiological parameters within limits described above and prevent development of initial symptoms of heat stress related conditions. If the physiological limits are exceeded or symptoms develop, the work period should be reduced and rest period increased. Rest areas should be cool (in areas such as shade, air conditioned buildings, or vehicles) and away from heat exposure.

- In extreme heat conditions, employees may wear heat-control clothing such as ice vests or cool suits. Physiological monitoring should still be conducted and work/rest regimens implemented to keep physiological parameters within recommended limits.

- Mobile showers or hoses can be used to cool down workers in waterproof protective clothing.

- Shield sources of radiant heat.

- Provide shaded work areas.

- Conduct activities in early morning and late evening to avoid the hottest parts of the day.

- Allow employees to become acclimatized to the heat by performing less strenuous activities for the first few days. Schedule more physically demanding work later.

- Provide adequate, cool drinking water for consumption during break periods.

- Avoid consumption of beverages such as coffee, tea, or colas that act as diuretics and dehydrate the body.

16.14 Cold Stress

Persons working outdoors in low temperatures, especially below freezing, or in wet or snowy weather are potentially subject to cold stress disorders. Factors that contribute to cold stress exposure include temperature, humidity, wind, sunlight, rain, snow, fog, exposure duration, clothing, and work activity. Individual susceptibility to cold stress disorders can vary widely. Individual physical factors that can affect a person's response to cold work environments include a person's general fitness and age.

The following guidelines should be considered when working in ambient air temperatures below 40°F, especially when other contributing weather conditions such as snow, rain, or wind are present.

16.14.1 Hazards Associated with Cold Stress

Hypothermia – Hypothermia results from a cooling of the body's core temperature and if left unattended can become a serious condition. Hypothermia can result in the loss of physical skills and impair judgment thereby contributing to the potential for other accidents. Severe hypothermia can result in death. Hypothermia can occur at temperatures above freezing as well as below.

- Symptoms include shivering, teeth chattering, fumbling hands, slurred speech, and loss of coordination. Eventually, the pulse and respiratory rate may slow. The victim may appear blue or lose color in the face.

- Treatment for hypothermia is to catch symptoms early and move the individual to a warm environment indoors or in a vehicle. If a warm location is not immediately available, the victim should be sheltered from the wind and provided extra clothing such as coats or blankets and observed to determine if their condition is improving. If the victim continues to deteriorate and becomes colder, they should be transported to a medical facility for assistance.

Frostbite – Frostbite is a condition in which the fluids around cells of body tissue freeze. The condition can lead to body tissue damage. The most vulnerable parts of the body are the nose, ears, cheeks, fingers, and toes.

- Symptoms of frostbite include body parts becoming white, firm, cold to the touch, and may feel waxy. The victim will not feel pain in the affected area.

- Treatment of frostbite requires that the victim be brought to a warm environment and the affected areas be allowed to thaw and warm. If frostbite has progressed beyond small patches of skin and affects whole body parts such as a hand, foot, or ear, the victim should be transported to a medical facility for treatment and observation.

16.14.2 Cold Stress Monitoring

Personnel should monitor themselves and each other for signs and symptoms of frostbite and/or hypothermia. If symptoms are observed in an employee or subcontractor, steps should be taken to treat the symptoms by having the individual go to a warm environment either in a nearby structure or vehicle.

16.14.3 Cold Stress Control and Prevention

Cold stress can easily be prevented with proper planning and prevention. Some basic controls and preventative measures are listed below:

- Forecasted conditions. Consider the effect of wind chill (Table 16-2 on next page).
- Dress in layers and stay dry. Avoid cotton clothing such as socks or T-shirts. Bring extra clothing.
- Wear hardhat liners and gloves. Wear rain gear in rain and snow.
- Curtail work if extreme weather conditions such as a blizzard, extreme wind chill (e.g., less than 0°F), torrential cold rains, or wind is expected.
- For long-term projects in cold environments, consider setting temporary structures with portable heaters.
- Take warming breaks as needed.
- Avoid beverages with caffeine, alcohol, or medications that restrict blood flow.
- Drink warm noncaffeine beverages such as hot chocolate or soups on breaks.

Table 16-2
Windchill Index

WINDCHILL INDEX	***Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under calm conditions)***											
Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Wind speeds greater than 40 mph have little additional effect	**LITTLE DANGER** in < hour with dry skin. Maximum danger of false sense of security.				**INCREASING DANGER** Danger from freezing of exposed flesh within 1 minute.			**GREAT DANGER** Flesh may freeze within 30 seconds.				
	From *Fundamentals of Industrial Hygiene,* Third Edition. Plog, B.A., Benjamin, G. S., Kerwin, M.A., National Safety Council, 1988.											

16.15 Working Around Heavy Equipment

Good work practices while working around heavy equipment include:

- Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.
- If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.
- Stay clear of pinch points and swing areas of equipment. At CDM projects, these areas should be taped or barricaded off; however, when equipment moves frequently, you cannot count on other organizations to mark these zones.
- Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.
- On a noisy site, you may not notice the equipment's back-up alarm. Keep aware of what is happening around you.
- Never walk under a load on a crane or hoist. Indeed, avoid the area under the hook or bucket.
- Do not cut across the path of equipment backing up.
- Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.
- On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.
- Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.

16.18 Safety Working Around Drill Rigs

The use of mechanical drill rigs to collect soil samples and install monitoring wells presents significant hazards to operators and helpers, as well as technicians and engineers who may work in proximity to such rigs. CDM employees that manage or oversee drilling operations should be aware of the basic hazards of drilling equipment and operations and have an awareness of safe drilling work practices. The guidelines and work practices described below should be implemented on all projects where mechanical drill rigs are used.

16.18.1 Preparation

- Contract documentation with drillers contracted with CDM should include CDM's standard contract between "Engineer & Subcontractor for Drilling Services," and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at http://cdmweb/legalforms/inc.htm.

- Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or magnetometer studies may be needed to identify the location of underground obstructions.

- The work area for the drill rig and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.

- Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.

- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.

- If working in an area of moving vehicular traffic, appropriate traffic control systems should be in place. Contact local police or traffic control officer, before placing any traffic control equipment (Section 16.22).

- Define an exclusion zone around the drill rig that is at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.

16.18.2 Drill Rig Inspection

- After the rig is set up, but before operation, the work area should be inspected for eye, bump, and tripping hazards.

- The driller should inspect the rig daily before operation of the rig. The inspection should include the following:
  - Condition of the vehicle. Brakes should work and tires should have adequate tread. It should have a back-up alarm. If it is driven over the road, it should have all necessary brake lights, headlights, horn, license plates, etc.
  - All welds should be solid, with no sign of visible cracks.
  - All gauges should be functional and legible.
  - All machine guards should be in place.
  - Emergency kill switches should be functional. All site personnel should be aware of the location and function of the kill switches. Have the driller review these with site personnel.
  - Cable and wire rope should be inspected for fraying, decay, "bird caging," broken strands, kinking, or flattening.
  - All hoses should be secure and in good shape. They should not be loose, bulging, or leaking.
  - High-pressure fittings should be secure and have whip checks (a pin or wire to prevent the hose whipping in the event of a failure of the connection).
  - High-pressure relief valves should be in working order.
  - Wire rope loops should be secure with at least two clamps.
  - The rig should have a fire extinguisher and first aid kit.
  - All tools should be clean and in good working condition. Hooks, eyes, pins, etc. should not be corroded or bent. Rod clamps should be in good condition.
  - If a cathead is used, it should be clean and free of burrs. The cathead rope should be in good condition and not be frayed or have excessive wear.
  - Back-up alarms should be functional.
  - Vehicles should have all lug nuts and they should all be tight.

16.18.3 Work Practices

- All personnel working around drilling operations should wear appropriate PPE including a hard hat, safety glasses, and hard-toed work boots.
- Drill crews should wear work gloves.

- On hazardous waste sites, additional PPE such as respirators, protective clothing, gloves, etc. may also be required.
- In areas where there is vehicular traffic, personnel should also wear high-visibility vests or clothing.
- Maintain an organized work area free from tripping hazards.
- Drill rods or other equipment should not be stored leaning up against equipment.
- Drill holes should be completed or secured before leaving the site for the day. Drill holes should not be left open at an unattended site.
- Boring locations should be placed to minimize the possibility of contacting underground utilities or structures. Clearance should be obtained from the site project manager before drilling begins.
- Do not move the rig with the mast in the upright position.
- Use a spotter when moving the rig from one location to another on the site.
- When sampling activities require working in proximity with heavy equipment or drill rigs, sampling personnel will stand clear of the equipment until sampling is required. They will notify the operator they are going to take a sample and must receive acknowledgment from the operator.
- Do not wear loose clothing such as hooded sweatshirts, parkas, or clothing with hanging drawstrings around drill rigs.
- Monitor weather conditions. Drilling operations should be terminated and the area near the drill rig evacuated during high winds and or storms with the potential for lightning strikes. The lead driller should be consulted to help assess if weather conditions are safe for drilling.
- Drill crew personnel should wear a personal fall arrest harness, connected to a secure tie-off point, when climbing the mast or working where fall exposures exceed 6 feet.
- Hearing protection should be worn during operations that produce significant noise exposures. (If you cannot hold a conversation using a normal voice with someone within 3 feet of you because of background noise, the use of personal hearing protection is recommended.)

16.20 Hazardous Waste Site Controls

Work sites designated as hazardous waste sites must control access to the work area to only authorized personnel and conform to general work practices expected at hazardous waste site operations as required by the OSHA Standard for Hazardous Waste Operations, 29 CFR 1910.120. The following concepts should be reflected in the HSP for the project.

16.20.1 Access Control

Controlled access to hazardous waste site work areas is required to protect personnel working on the site as well as to limit the potential for transporting contaminants off site. Depending on the size of the work site, hazards and contaminants present, and complexity of the work, access control may range from verbally cautioning nonauthorized personnel to stay away from the work area, to a program including site security, signs, or formal sign-in and sign-out procedures. Details of site-specific access control procedures should be included in the site-specific HSP. Some general work practices for access control are noted below:

For small-scale site investigations that are short-term projects (i.e., days, not weeks or months), identify a work area to the work crew and keep persons not associated with the job site out of the work area. If the site is in an area where nonauthorized persons are likely to be encountered, traffic cones, caution tape, and signs identifying the area as a controlled access area may be used.

For more extensive projects where work may be done for weeks or longer, the team should deploy more extensive access controls. They should:

- Set up physical barriers and hire security personnel to prevent nonauthorized persons from entering the work site.
- Keep the number of personnel and equipment on site to the minimum required to do the project effectively and safely.
- Establish work zones within the site (Section 16.20.2).
- Establish controlled access points to be used by authorized personnel.
- Track the entry and exit of personnel through a check-in, checkout system.
- Establish a formal decontamination corridor from exclusion zones.

16.20.2 Work Zones

Field project managers working under HSPs for hazardous waste operations are required to establish work zones to prevent or reduce the spread of site contaminants to noncontaminated areas on or off site. Movement between zones should be restricted to those that need access to a specific area, and entry and exit between zones should be through designated access control points. A description of the three work-zone system for hazardous wastes is provided below.

Exclusion Zone – The exclusion zone should include any area where contamination is known or suspected. Areas of air, water, or soil that are contaminated with hazardous materials (biohazards, radioactive materials, chemicals) should be included in the exclusion zone. The zone should be well known to site workers. On smaller projects, this can be a verbal identification to site workers, such as "a 20-foot radius around the drill rig." On larger projects, or in areas that may be encountered by observers or the general public, the zone may need to be defined with caution tape, traffic cones, or in some instances, fencing and barriers. The need will be site-specific and the specific method should be identified in the site-specific HSP. Some work practices that should be followed in the exclusion zone include:

- Employees in the exclusion zone must wear the PPE designated in the site HSP for tasks executed within the zone.
- No eating, drinking, chewing gum or tobacco, smoking, application of cosmetics, including application of lip balm, sunscreen, or insect repellant is allowed in the exclusion zone.
- Sitting or kneeling in areas of high concentrations of contaminants should be avoided.
- If any PPE becomes defective, the employee should leave the work area via the designated egress area, decontaminate as needed, and replace the defective PPE before returning to work in the exclusion zone.
- Prescription drugs should not be used within the exclusion zone unless approved by CDM's medical consultant. The use of illegal drugs or consumption of alcohol is prohibited.
- When leaving the exclusion zone, employees should exit via the designated access/ egress point(s) and follow decontamination procedures described in the site HSP.

Contaminant Reduction Zone – A contaminant reduction zone (CRZ) is established to provide a transition between the exclusion zone and the support zone. The CRZ is set up at the access control points of the exclusion zone and will vary in size depending on the complexity of activities that need to occur within the zone. For small site investigations, the CRZ may simply be a designated area near containers set up to collect used disposable PPE and some soap and water. For larger projects, the CRZ may include specific decontamination points and be staffed by personnel specifically designated to participate in the decontamination of personnel and equipment exiting the exclusion zone. Depending on the site contaminants, level of contamination, and decontamination procedures, personnel in the CRZ may be required to wear protective clothing, gloves, or respirators. The specific requirements will be outlined in the site HSP. The CRZ should be placed in an area that is not contaminated at the boundary of the exclusion zone.

Support Zone – The support zone is established near the entrance to the site and is far enough from the exclusion zone and CRZ that specialized protective clothing or respirators are not used. The use of normal field PPE such as hard hats, safety glasses, and safety work boots is expected except for areas such as office trailers, break and

lunch areas, or other areas designated as having no known or anticipated hazards. Operational support activities and equipment storage and maintenance areas are located in the support zone. No equipment or personnel should go from the exclusion zone to the support zone without passing through the CRZ and being decontaminated in accordance with the site HSP.

Mobile Work Zone – For those projects that involve brief periods of work in multiple locations, a specific area may be designated as the exclusion zone for the duration of the work performed in that area. The exclusion zone can be terminated (provided there are no ongoing hazards or potential exposures to contaminants) and moved to the next area of work. For example, during soil borings or well installation, the exclusion zone can be defined as, "1.5 times the mast height" of the drill rig. Once the boring has been closed, or well installed and secured, and all drill cuttings have been secured, the area can be opened up and a new exclusion zone established around the next boring location.

16.20.3 Considerations when Establishing Work Zones

Work zones should be large enough to perform tasks within the zone safely, with no exposure to hazards to personnel outside the zone, but they should also be small enough to be able to secure and control access. Some considerations in establishing work zones include:

- Physical and topographical features of the site
- Dimensions of the contaminated area
- Weather
- Physical, chemical, and toxicological characteristics of contaminants and chemicals used in the zone
- Potential for exposure to site contaminants
- Known and estimated concentrations of contaminants
- Air dispersion of contaminants
- Fire and explosion potential
- Planned operations and space needed to perform the work safely
- Surrounding areas
- Decontamination procedures
- History of job site

16.20.4 General Hazardous Waste Site Work Practices

- **Buddy System** - Work should be scheduled so that no person works unobserved within the exclusion zone at any time. Each worker within the exclusion zone should maintain visual contact with at least one other worker on the site. All site personnel should remain aware of each other and monitor each other's condition.

- **Eating, drinking, chewing gum or tobacco, and smoking** are prohibited within the contaminant reduction and exclusion zones. (**Exception for heat stress:** Squirt bottles of water, Gatorade, or other fluids may be consumed via squirt bottles in the contaminant reduction zone with the approval of the HSM. Open bottles, cups, etc. should not be permitted.)

- Sitting or kneeling should be avoided in areas of known or suspected areas of contamination.
- Hands and face should be thoroughly washed when leaving the work area.
- Defective PPE should be repaired or replaced immediately.

Sections 5, 6, 7, 9, and 11 of this manual are particularly applicable to H&S at hazardous waste sites.

16.21 Decontamination at Hazardous Waste Sites

Proper decontamination helps protect employees and prevents the contamination of uncontaminated areas. Decontamination protects all site personnel by minimizing the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and protects the community by preventing uncontrolled transportation of contaminants from the site.

16.21.1 Prevention of Contamination

To prevent contamination, crew members should:

- Follow procedures for proper dressing before entry into the exclusion zone. Proper dressing will minimize the potential for contaminants to bypass the PPE and escape decontamination.

- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials, or cover equipment and tools with a strippable coating, which can be removed during decontamination.

- Encase any source of contaminants on the site with barriers (e.g., plastic sheeting or over packs).

- Stress work practices that minimize contact with hazardous substances. Use remote sampling, handling, and container-opening techniques.

16.21.2 Decontamination Equipment Selection

In selecting decontamination equipment, consider whether the equipment must be decontaminated for reuse or can be easily disposed. Recommended equipment for decontamination includes:

- Storage tanks or appropriate treatment systems
- Drains or pumps
- Long-handled brushes
- Wash solutions appropriate for the contaminants present
- Rinse solutions appropriate for the contaminants present
- Pressurized sprayers for washing and rinsing
- Curtains, enclosures, or spray booths
- Long-handled rods and shovels
- Containers to hold contaminants and contaminated soils
- Wash and rinse buckets
- Brooms
- Containers for the storage and disposal of contaminated material

16.21.3 Decontamination Design

Decontamination facilities should be located in the CRZ, i.e., the area between the exclusion zone (the contaminated area) and the support zone (the clean area), and described in the site HSP.

- Site-specific factors that affect the decontamination facility design must be considered. Typical factors include:

  - The chemical, physical, and toxicological properties of the wastes
  - The pathogenicity of infectious wastes
  - The amount, location, and containment of contaminants
  - The potential for and location of exposure based on assigned worker duties, activities, and functions
  - The potential for wastes to permeate, degrade, or penetrate materials used for personal protective clothing and equipment, vehicles, tools, buildings, and structures
  - The proximity of incompatible wastes
  - The movement of personnel and/or equipment among different zones
  - The emergencies that may arise
  - The methods available for protecting workers during decontamination
  - The impact of the decontamination process and compounds on worker H&S

- Decontamination Line

  - Decontamination should be an organized process by which levels of contamination are reduced.
  - The decontamination process consists of a series of steps performed in a specific sequence. For example, outer, more heavily contaminated items are decontaminated first, followed by the decontamination and removal of inner, less contaminated items.
  - Each step should be performed at separate stations to prevent cross contamination.
  - Decontamination stations should allow enough separation to prevent cross contamination and should be arranged in order of decreasing contamination.
  - Separate decontamination areas should be provided to isolate workers from different contamination zones containing incompatible wastes or decontamination processes.
  - Entry and exit points should be conspicuously marked. Preferably the entry to the CRZ from the exclusion zone should be separate from the entry to the exclusion zone from the CRZ.
  - Dress-out stations for entry to the CRZ should be separate from redressing areas for exit from the CRZ.
  - Personnel who wish to enter clean areas of the decontamination facility, such as locker rooms, must be appropriately decontaminated first.
  - Examples of decontamination lines and procedures for personnel wearing various levels of protection are provided in Exhibits 16A and B.

16.21.4 PPE for Decontamination Workers

A rule of thumb is that decontamination workers wear a level of protection one level below the level of protection worn in the exclusion zone. However, consideration should be given to the following when determining the level of protection for a given project.

- The nature of site contamination
- Degree of contamination expected on workers leaving the exclusion zone
- The results of wipe tests and onsite air monitoring

Some site-specific cases may require that decontamination personnel wear the same level of PPE as workers in the exclusion zone. Cases include:

- Workers using a steam jet may need a different type of respiratory protection than other decontamination personnel because of the high moisture content of the steam jets.

- Cleaning solutions used and wastes removed during decontamination may generate harmful vapors, requiring a different type of respiratory or clothing protection.

16.21.5 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated area of a site should be decontaminated to remove any harmful chemicals, radioactive material, or infectious organisms that may have adhered to them. The extent of decontamination will vary depending on the nature of site activity, site contamination, and other factors.

- Decontamination methods available include:

  - Physical removal
  - Chemical detoxification or disinfections/sterilization
  - A combination of both physical and chemical methods

- The selected decontamination method should be reviewed for any safety and health hazards. If the selected method poses a direct health hazard, measures shall be taken to protect both the decontamination personnel and the workers to be decontaminated.

- Physical Removal

  - Physical methods using high pressure and/or heat should be used with caution.
  - Loose contaminants can be removed by using a soap and water rinse with a soft bristle brush to remove dust and vapors that cling to equipment and workers, or that are trapped in small openings, such as clothing or fabric weaving.

- Adhering contaminants can be removed by:

  - Scraping, brushing, and wiping.
  - Solidifying.
  - Freezing (using dry ice or ice water).
  - Adsorption or absorption (e.g., kitty litter or powdered lime).
  - Melting.
  - Volatile liquid contaminants can be removed from PPE or equipment by evaporation followed by a water rinse. Evaporation may be expedited by the use of steam jets.

- Chemical Removal

  - Decontamination using chemicals should only be done if recommended by an industrial hygienist or other qualified professional.
  - Any chemical used in the decontamination process must be chemically compatible with the equipment or clothing being decontaminated.
  - Halogenated solvents should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.

- Chemical removal types include the following:

  - Surface contaminants can be dissolved in a solvent.
  - Solidification of liquid or gel contaminants can enhance their physical removal. Typical solidification processes are moisture removal using adsorbents such as grounded clay or powdered lime; and chemical reactions using polymerization chemicals and/or chemical reagents.

16.21.6 Personnel Decontamination

Different levels of personnel protection, as discussed in the PPE guidelines, may be used at any given site. The following is a description of the decontamination process for each level of protection.

- **Level D**

  - An area should be designated for the gross removal of dirt and mud from gloves and boot covers. Paper towels and buckets of rinse water can be made available for this purpose.
  - Typical decontamination steps for Level D operations are provided in Exhibit 16-B.
  - Soap and water should be used to wash hands and face before leaving the site.
  - Laundering of personal clothing should be completed as soon as possible once offsite.

- **Level C and B**

  - A decontamination line should be established.
  - Site-specific procedures should be outlined in the site HSP. The recommended procedure for this layout is listed in Exhibit 16-C.

- **Level A** - It is not anticipated CDM will directly participate in Level A operations. If required, site-specific procedures will be developed in coordination with the division HSM.

16.21.7 Sampling and Monitoring Equipment Decontamination

Sampling equipment often becomes grossly contaminated. Often trowels or drum thieves (coliwassas) are dedicated to a particular site. These should be left in the exclusion zone and disposed of as contaminated waste at the end of site work. Sampling equipment such as split spoons or other equipment that is used to collect several samples must be cleaned and decontaminated between samples to prevent cross contamination. These items should be cleaned and decontaminated in accordance with the project operations or sampling plan. Dirt and wash solutions from sampling equipment decontamination should be collected and disposed of as investigation-derived waste.

Once grossly contaminated, testing and monitoring instrumentation can be difficult to decontaminate without causing damage to the instrument. Care should be taken in the field to prevent gross contamination of field instruments by avoiding direct contact between the instrument and contaminated soils, water, or surfaces. In some cases it may be necessary to place instruments in plastic bags, leaving small openings for sampling ports, detectors, and exhaust ports. The plastic bags can then be removed as the instrument comes out of the exclusion zone. The outside of instruments can be wiped down with paper towels or brushed off with clean soft brushes.

16.21.8 Heavy Equipment Decontamination

Drill rigs, trucks, backhoes, and other heavy equipment can be difficult to decontaminate. The method generally used is to wash them with water under pressure and scrub accessible areas with soap and warm water. Hot water and steam systems can be effective but may increase air concentrations of contaminants, exposing decontamination workers. Particular care should be taken where equipment comes into direct contact with contaminated soils such as tires, buckets, or treads. In severe cases, tires may need to be replaced or parts sand blasted clean or disposed of. Equipment should be visually inspected to be sure it is free of any visible signs of contamination. In some cases, wipe tests or other methods may be needed to confirm equipment has been adequately decontaminated before leaving the site.

16.21.9 Decontamination Solutions, Disposable PPE, and Site Wastes

Potentially contaminated equipment, disposable PPE, respirator cartridges, disposable sampling equipment, brushes, buckets, waste decontamination solutions, etc. should be secured in drums and labeled. Disposal methods for these materials may depend on client requirements and/or results of site investigation data. The confirmed presence of hazardous materials on the site may require disposal of investigation-derived wastes as hazardous wastes.

Care should be taken during work and decontamination activities to minimize waste materials generated.

Exhibit 16-B
Minimum Measures For Level D Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Hard Hat, Outer Boot, and Glove Removal	Remove hard hat, outer boots, and gloves.
Station 4 - Boots, Gloves, and Outer Garment Removal	Remove boots, suit, and inner gloves and deposit in separate containers lined with plastic.
Station 5 - Field Wash	Wash hands and face.

Exhibit 16-C
Minimum Measures For Level B, And C Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Hard Hat, Boots, and Gloves Wash and Rinse	Scrub outer boots, hard hat, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Tank/Air Canister Change	If a worker leaves the exclusion zone to change an air tank, air canister, or mask, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boots donned, and joints tapped. Worker returns to duty.
Station 4 - Outer Boots, and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 5 - SCBA/Respirator Removal	SCBA backpack and facepiece/respirator is removed (avoid touching face with fingers). SCBA or respirator is deposited on plastic sheets.
Station 6 - Inner Gloves and Outer Garment Removal	Remove suit and inner gloves and deposit in separate containers lined with plastic.
Station 7 - Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face.

16.22 Traffic and Work Zone Safety

These guidelines apply whenever CDM employees or subcontractors work in areas exposed to vehicular traffic on public streets or highways.

- Where vehicular traffic hazards exist because of work at locations near public streets or roads, a system of traffic and work zone controls should be developed to mitigate the hazard. The system should meet the requirements of Part 6 of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration, or the applicable state version of the MUTCD.

- In general, when the MUTCD allows the use of traffic safety direction devices, such as cones, CDM will supplement those direction devices with a physical barrier, such as a truck.

- All traffic control systems on public roads must be coordinated with local traffic control officials as required by applicable law.

- Periodically evaluate effectiveness of temporary traffic control setups by walking or riding the job area looking for evidence of poor controls and near misses such as swerving traffic, motorists braking quickly, skid marks, blind spots, etc.

- Give motorists plenty of advanced warning of upcoming work zones.

- All employees working within designated work zones or near vehicular traffic should wear high-visibility clothing such as orange, yellow, or yellow-green shirts, jackets, or vests. During wet or inclement weather, similarly colored rainwear should be worn.

- During night work, between the hours of sunset and sunrise, high-visibility clothing should incorporate reflective striping or fabric and be visible at a distance of 1,000 feet. This clothing should meet ANSI standard #107 for High Visibility Safety Apparel.

- All employees working near traffic and vehicles must maintain situational awareness at all times. Stay mindful that warning signs and cones inform drivers to take action but that some drivers may not pay attention, and vehicles may still enter the work zone.

16.24 Cell Phone Safety

16.24.1 Cell Phone Use and Driving

The National Highway Traffic Safety Administration (NHTSA) published a report in 2001 titled *An Investigation of the Safety Implications of Wireless Communications in Vehicles*. Based on the NHTSA report, the following guidelines should be followed when using your cell phone in a vehicle:

- Minimize the use of cell phones while driving. To the extent possible, place calls ahead of time while in the office, home, or if on the road, at a location where you can safely pull off the road.
- If you receive an incoming call, let your voice mail answer it and call the person back after you have stopped the vehicle at a safe location.
- If you must use your phone while driving, use hands-free systems and get to know the features such as auto-redial, speed dial, and voice-activated dialing.
- Engage in short conversations. If lengthy discussions are required, suspend the conversation and find a safe place to stop before continuing the discussion.
- Do not take notes while talking on the phone and driving. (This may seem silly, but was not an uncommon observation made by the authors of the NHTSA report.)

Some of the findings in the NHTSA report are summarized below:

- The use of cell phones while driving increases the risk of an accident.
- Contributing factors included distractions while dialing, being startled when the cell phone rang, and the act of engaging in conversation.
- The most significant factor was the act of conversation. The implication of this is that hands-free systems do not mitigate the biggest hazard associated with the use of cell phones while driving.
- Dialing the cell phone, while a distraction, was similar to the distraction potential of manually tuning a car radio.
- There is currently insufficient data to determine the magnitude of the problem because of the inconsistency of reporting accident causes.
- The presence of cell phones in vehicles enhances the notification of emergency services when needed.
- While cellular telephones clearly have distraction potential from many standpoints, such effects may be minimized if drivers are aware of the hazards, are judicious in their use of the technology, and if ergonomically sound cellular telephone designs are used.
- Eighty-five percent of cell phone users use their cell phones while driving.
- Many cities and states either have passed or are considering legislation to regulate cell phone use while driving.

Additional information related to cell phone H&S can be found at the following websites:

www.nhtsa.dot.gov/people/injury/research/wireless

www.nejm.org/content/2001/0344/0002/0133.asp

www.fda.gov/cdrh/ocd/mobilephone.html

16.24.2 Radio Frequency Radiation

Some of the information related to radio frequency exposure and cell phone use available from recognized peer reviewed journals and government agencies are listed below:

- Numerous studies looking at the use of hand-held cell phones and risk of brain cancer have indicated no association between the use of cell phones and risk of brain cancer. This includes the two most recent studies published in the Journal of the American Medical Association (AMA) and the New England Journal of Medicine (NEJM), which are among the most comprehensive undertaken as of January 2001.

- Some of the studies conducted have indicated there are biological effects associated with exposure to the types and levels of radio frequency radiation associated with cell phone use; however, there is no consensus that these effects are harmful to people.

- An editorial published in the NEJM referencing a study published in its January 2001 issue concluded, "This study allays fears raised by alarmist reports that the use of cellular phones causes brain tumors. Of course, we do not have the final word on this question, and results of future investigations may modify our perspective. Nevertheless, we believe that it is highly unlikely that the use of cellular telephones substantially increases the risk of brain tumors."

Based on the information currently available, there is not a significant health hazard associated with radio frequency radiation exposure related to cell phones. Suggestions for limiting radio frequency radiation exposure related to cellular telephone use have been published by the Food and Drug Administration (FDA) and are listed below:

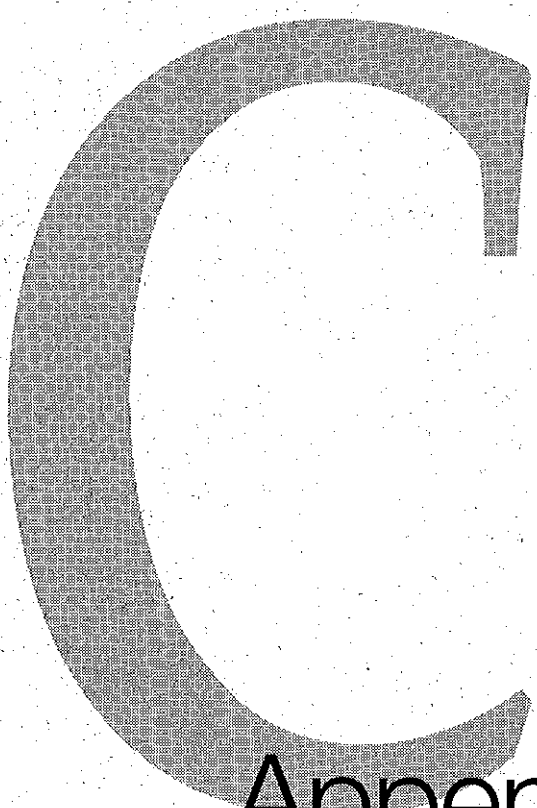
- Limit cell phone use. Where possible, hold lengthy conversations on conventional phones and use cell phones for short conversations and for situations when conventional phones are not available.

- When using a mobile phone or a cell phone in a vehicle, connect it to an antenna located outside the vehicle.

- Use a "hands free" headset and a remote antenna with the cell phone carried at the waist.

- Use a cell phone with a low specific absorption rate (SAR) as published by the Federal Communications Commission (FCC).

The FCC has published a list of SAR values for almost all cell phone models manufactured since 2000. The SAR is a measure of the amount of radio frequency radiation absorbed under certain test conditions. This information is available at www.fcc.gov/oet/rfsafety/.



Appendix C

APPENDIX C
MATERIAL SAFETY DATA SHEETS

MSDS SHEETS INCLUDED:

Sulfuric Acid
Hydrochloric Acid
Sodium Hydroxide
Trichloroethene (TCE)
Tetrachloroethene (PCE)
1,2-Dichloroethane
1,1-Dichloroethane
Liquinox

Health	3
Fire	0
Reactivity	2
Personal Protection	

Material Safety Data Sheet
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H2-SO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid.
White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact.
May ignite other combustible materials.
May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated)
Nitramide decomposes explosively on contact with concentrated sulfuric acid.
1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation
TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation
TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation
TWA: 1 (mg/m3) from NIOSH [United States] Inhalation
TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C
Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water.
Sulfuric is soluble in water with liberation of much heat.
Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases.
Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316).
Highly corrosive in presence of stainless steel(304).
Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product.
Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile+water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene + sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides,
Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.).
Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dillute acid attacks most metals.
Attacks many metals releasing hydrogen.
Minor corrosive effect on bronze.
No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 2140 mg/kg [Rat.].
Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH.
May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive).
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L
Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS)
Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis.
Eye: Causes severe eye irritation and burns. May cause irreversible eye injury.
Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis.
Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration).
Chronic Potential Health Effects:
Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion).
Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sulfuric acid
New York release reporting list: Sulfuric acid
Rhode Island RTK hazardous substances: Sulfuric acid
Pennsylvania RTK: Sulfuric acid
Minnesota: Sulfuric acid
Massachusetts RTK: Sulfuric acid
New Jersey: Sulfuric acid
California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid
Tennessee RTK: Sulfuric acid
TSCA 8(b) inventory: Sulfuric acid
SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid
SARA 313 toxic chemical notification and release reporting: Sulfuric acid
CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns.
S2- Keep out of the reach of children.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S30- Never add water to this product.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves.
Full suit.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Face shield.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer).
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid].
MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible.
Calcium carbide reacts with hydrogen chloride gas with incandescence.
Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine.
Rubidium acetylene carbides burns with slightly warm hydrochloric acid.
Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved.
Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas.
Cesium acetylene carbide burns hydrogen chloride gas.
Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute.
Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:
Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate.
Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture.
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States]
CEIL: 7 (mg/m3) from OSHA (PEL) [United States]
CEIL: 5 from NIOSH
CEIL: 7 (mg/m3) from NIOSH
TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)]
TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water)
83 C @ 760 mm Hg (for 31% HCl in water)
50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water)
-46.2 C (31.24% HCl in water)
-25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1)
1.10 (20%and 22% HCl solutions)
1.12 (24% HCl solution)
1.15 (29.57% HCl solution)
1.16 (32% HCl solution)
1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals.
Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316).
Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product.
Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C.
Sodium reacts very violently with gaseous hydrogen chloride.
Calcium phosphide and hydrochloric acid undergo very energetic reaction.
It reacts with oxidizers releasing chlorine gas.
Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates.
Reacts with most metals to produce flammable Hydrogen gas.
Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure)
Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid.
Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction.
Hydrogen chloride causes aldehydes and epoxides to violently polymerize.
Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:
Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions).
It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys.
No corrosivity data on zinc, steel.
Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse].
Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid].
May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin,

eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, .
Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL)
LDL [Man] -Route: Oral; 2857 ug/kg
LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M
LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity).
May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Corrosive. Causes severe skin irritation and burns.
Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis.
Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure,
occur, particularly if exposure is prolonged. May affect the liver.
Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis).
Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel.
Chronic Potential Health Effects:
dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid
Illinois toxic substances disclosure to employee act: Hydrochloric acid
Illinois chemical safety act: Hydrochloric acid
New York release reporting list: Hydrochloric acid
Rhode Island RTK hazardous substances: Hydrochloric acid
Pennsylvania RTK: Hydrochloric acid
Minnesota: Hydrochloric acid
Massachusetts RTK: Hydrochloric acid
Massachusetts spill list: Hydrochloric acid
New Jersey: Hydrochloric acid
New Jersey spill list: Hydrochloric acid
Louisiana RTK reporting list: Hydrochloric acid
Louisiana spill reporting: Hydrochloric acid
California Director's List of Hazardous Substances: Hydrochloric acid
TSCA 8(b) inventory: Hydrochloric acid
TSCA 4(a) proposed test rules: Hydrochloric acid
SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid
SARA 313 toxic chemical notification and release reporting: Hydrochloric acid
CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns.
R37- Irritating to respiratory system.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Full suit.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide

Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not available

Special Remarks on Fire Hazards:
sodium hydroxide + zinc metal dust causes ignition of the latter.

Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, ally alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane.
Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials.
Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontanously in air.
sodium hydroxide and cinnamaldehyde + heat may cause ignition.
Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:
Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate.
Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aquesous sodium hydroxide, under vacuum distillation, residue darkened and exploded.
Sodium Hydroxde + impure tetrahydrofuran, which can contain peroxides, can cause serious explosions.
Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C.
Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:
Corrosive solid.
Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 2 (mg/m3) from ACGIH (TLV) [United States]

TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States]
CEIL: 2 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]

Boiling Point: 1388°C (2530.4°F)

Melting Point: 323°C (613.4°F)

Critical Temperature: Not available.

Specific Gravity: 2.13 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:
Highly reactive with metals.
Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:
Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process.
Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahyrofuran is very exothermic, a mild explosion being noted on one occassion.

Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, foraldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. berylium, lead acetate, nickel carbonyl, tetraethyl lead), mitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phorosous pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde.
Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available.
LC50: Not available.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.
May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive).
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose:
LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sodium hydroxide
Illinois chemical safety act: Sodium hydroxide
New York release reporting list: Sodium hydroxide
Rhode Island RTK hazardous substances: Sodium hydroxide
Pennsylvania RTK: Sodium hydroxide
Minnesota: Sodium hydroxide
Massachusetts RTK: Sodium hydroxide
New Jersey: Sodium hydroxide
Louisiana spill reporting: Sodium hydroxide
California Director's List of Hazardous Substances: Sodium hydroxide
TSCA 8(b) inventory: Sodium hydroxide
CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R35- Causes severe burns.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S37/39- Wear suitable gloves and eye/face protection.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Synthetic apron.
Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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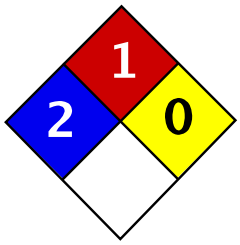

Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the

product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV)
TWA: 269 STEL: 1070 (mg/m3) from ACGIH
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone.
Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum.
Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse].
Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.
The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene
Pennsylvania RTK: Trichloroethylene
Florida: Trichloroethylene
Minnesota: Trichloroethylene
Massachusetts RTK: Trichloroethylene
New Jersey: Trichloroethylene
TSCA 8(b) inventory: Trichloroethylene
CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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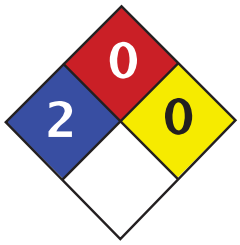

Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP.
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.
TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 (ppm) from OSHA (PEL) [United States]
TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States]
TWA: 170 (mg/m3) from OSHA (PEL) [United States]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane.
It dissolves in most of the fixed and volatile oils.
Solubility in water: 0.015 g/100 ml @ 25 deg. C
It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents.
Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium.
Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 2629 mg/kg [Rat].
Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP.
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.
May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract,

skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation.
Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc:
LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg
LDL [Dog] - Route: Oral; Dose: 4000 mg/kg
LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic).
May affect genetic material (mutagenic).
May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts.
Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain.
Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema
Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation.
Chronic Potential Health Effects:
Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation.
Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene
Connecticut hazardous material survey.: Tetrachloroethylene
Illinois toxic substances disclosure to employee act: Tetrachloroethylene
Illinois chemical safety act: Tetrachloroethylene
New York release reporting list: Tetrachloroethylene
Rhode Island RTK hazardous substances: Tetrachloroethylene
Pennsylvania RTK: Tetrachloroethylene
Minnesota: Tetrachloroethylene
Michigan critical material: Tetrachloroethylene
Massachusetts RTK: Tetrachloroethylene
Massachusetts spill list: Tetrachloroethylene
New Jersey: Tetrachloroethylene
New Jersey spill list: Tetrachloroethylene
Louisiana spill reporting: Tetrachloroethylene
California Director's List of Hazardous Substances: Tetrachloroethylene
TSCA 8(b) inventory: Tetrachloroethylene
TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97
SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene
CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects.
R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S23- Do not breathe gas/fumes/vapour/spray
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S37- Wear suitable gloves.
S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,2-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,2-Dichloroethane

Catalog Codes: SLD2521, SLD3721

CAS#: 107-06-2

RTECS: KH9800000

TSCA: TSCA 8(b) inventory: 1,2-Dichloroethane

CI#: Not available.

Synonym: Ethylene dichloride

Chemical Formula: C2H4CL2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,2-}Dichloroethane	107-06-2	100

Toxicological Data on Ingredients: 1,2-Dichloroethane: ORAL (LD50): Acute: 670 mg/kg [Rat]. 413 mg/kg [Mouse]. DERMAL (LD50): Acute: 2800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 1414.2 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of ingestion. Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant). Corrosive to skin and eyes on contact. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
Very hazardous in case of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified 2B (Possible for human.) by IARC. Classified 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

The substance is toxic to lungs, the nervous system, liver, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 413°C (775.4°F)

Flash Points: CLOSED CUP: 13°C (55.4°F). OPEN CUP: 18°C (64.4°F).

Flammable Limits: LOWER: 6.2% UPPER: 15.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks.
Slightly flammable to flammable in presence of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Slightly explosive to explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Corrosive liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 10 CEIL: 75 (ppm) from ACGIH (TLV)
TWA: 40 CEIL: 300 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 83.5°C (182.3°F)

Melting Point: -35.3°C (-31.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.2351 (Water = 1)

Vapor Pressure: 61 mm of Hg (@ 20°C)

Vapor Density: 3.42 (Air = 1)

Volatility: Not available.

Odor Threshold: 26 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, n-octanol, acetone.
Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 413 mg/kg [Mouse].
Acute dermal toxicity (LD50): 2800 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 1414.2 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified 2B (Possible for human.) by IARC. Classified 2 (Reasonably anticipated.) by NTP.
The substance is toxic to lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Extremely hazardous in case of ingestion.
Very hazardous in case of inhalation.
Hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Ethylene dichloride : UN1184 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: 1,2-Dichloroethane
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,2-Dichloroethane
Pennsylvania RTK: 1,2-Dichloroethane

Massachusetts RTK: 1,2-Dichloroethane
TSCA 8(b) inventory: 1,2-Dichloroethane
CERCLA: Hazardous substances.: 1,2-Dichloroethane

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R11- Highly flammable.
R20/22- Harmful by inhalation and if swallowed.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:17 PM

Last Updated: 11/06/2008 12:00 PM

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1-Dichloroethane

Catalog Codes: SLD3280

CAS#: 75-34-3

RTECS: KI0175000

TSCA: TSCA 8(b) inventory: 1,1-Dichloroethane

CI#: Not available.

Synonym:

Chemical Name: 1,1-Dichloroethane

Chemical Formula: C2-H4-Cl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,1-}Dichloroethane	75-34-3	100

Toxicological Data on Ingredients: 1,1-Dichloroethane: ORAL (LD50): Acute: 725 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].
The substance is toxic to kidneys, lungs, liver, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 458°C (856.4°F)

Flash Points: CLOSED CUP: -17°C (1.4°F). OPEN CUP: -6°C (21.2°F).

Flammable Limits: LOWER: 5.6% UPPER: 11.4%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth,

sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, alkalis.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 250 (ppm) from ACGIH (TLV) [1999]
TWA: 100 (ppm) from OSHA (PEL)
Australia: TWA: 200 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Chloroform like odor (Slight.)

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 57.3°C (135.1°F)

Melting Point: -96.9°C (-142.4°F)

Critical Temperature: 261.5°C (502.7°F)

Specific Gravity: 1.175 (Water = 1)

Vapor Pressure: 180 mm of Hg (@ 20°C)

Vapor Density: 3.44 (Air = 1)

Volatility: Not available.

Odor Threshold: 120 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in diethyl ether.
See solubility in water, diethyl ether.

Solubility: Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Corrosive in presence of aluminum.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Will attack some forms of plastic and rubber

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 725 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH.
DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].
The substance is toxic to kidneys, lungs, liver, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:
CLASS 3: Combustible liquid with a flash point greater than 37.8C (100F).
Marine pollutant

Identification: : 1,1-Dichloroethane : UN2362 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65 (no significant risk level): 1,1-Dichloroethane
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,1-Dichloroethane
Rhode Island RTK hazardous substances: 1,1-Dichloroethane
Pennsylvania RTK: 1,1-Dichloroethane
Florida: 1,1-Dichloroethane
Minnesota: 1,1-Dichloroethane
Massachusetts RTK: 1,1-Dichloroethane
New Jersey: 1,1-Dichloroethane
New Jersey spill list: 1,1-Dichloroethane
TSCA 8(b) inventory: 1,1-Dichloroethane
TSCA 8(a) PAIR: 1,1-Dichloroethane
TSCA 8(d) H and S data reporting: 1,1-Dichloroethane: June 1999
TSCA 12(b) one time export: 1,1-Dichloroethane
SARA 313 toxic chemical notification and release reporting: 1,1-Dichloroethane: 1%
CERCLA: Hazardous substances.: 1,1-Dichloroethane: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable.
R22- Harmful if swallowed.
R37/38- Irritating to respiratory system and skin.
R41- Risk of serious damage to eyes.
R52- Harmful to aquatic organisms.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:07 PM

Last Updated: 11/06/2008 12:00 PM

LIQUINOX MSDS

Section 1 : PRODUCT AND COMPANY IDENTIFICATION

Chemical family: Detergent.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Supplier: Same as manufacturer.

Product name: Liquinox

Section 2 : INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : HAZARD IDENTIFICATION

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of acute exposure

Eye contact: May cause irritation.

Skin contact: Prolonged and repeated contact may cause irritation.

Inhalation: May cause headache and nausea.

Ingestion: May cause vomiting and diarrhea.
May cause gastric distress.

Effects of chronic exposure: See effects of acute exposure.

Section 4 : FIRST AID MEASURES

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
If irritation persists, seek medical attention.

Ingestion: Do not induce vomiting, seek medical attention.
Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.

Section 5 : FIRE FIGHTING MEASURES

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.
Use water spray to cool fire exposed containers.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Explosion Data

Sensitivity to static discharge: Not available.

Sensitivity to mechanical impact: Not available.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: Containers may rupture if exposed to heat or fire.

Section 6 : ACCIDENTAL RELEASE MEASURES

Leak/Spill: Contain the spill.
Prevent entry into drains, sewers, and other waterways.
Wear appropriate protective equipment.
Small amounts may be flushed to sewer with water.
Soak up with an absorbent material.
Place in appropriate container for disposal.
Notify the appropriate authorities as required.

Section 7 : HANDLING AND STORAGE

Handling procedures and equipment: Protect against physical damage.
Avoid breathing vapors/mists.
Wear personal protective equipment appropriate to task.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : EXPOSURE CONTROLS / PERSONAL PROTECTION

Precautionary Measures

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Exposure limit of material: Not available.

Section 9 : PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

Volatiles (%)

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C): 100 (212F)

Freezing point (°C): Not available.

pH: 8.5

Specific gravity @ 20 °C: (water = 1).
1.083

Solubility in water (%): Complete.

Coefficient of water\oil dist.: Not available.

VOC: None

Chemical family: Detergent.

Section 10 : STABILITY AND REACTIVITY

Chemical stability: Product is stable under normal handling and storage conditions.

Conditions of instability: Extreme temperatures.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizing agents.

Hazardous decomposition products: See hazardous combustion products.

Section 11 : TOXICOLOGICAL INFORMATION

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Section 12 : ECOLOGICAL INFORMATION

Environmental toxicity: No data at this time.

Environmental fate: No data at this time.

Section 13 : DISPOSAL CONSIDERATIONS

Waste disposal: In accordance with local and federal regulations.

Section 14 : TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: Not regulated.

Special shipping information: Not regulated.

Section 15 : REGULATORY INFORMATION

Canadian Regulatory Information

WHMIS classification: Not controlled.

DSL status: Not available.

USA Regulatory Information

SARA hazard catagories sections 311/312: Immediate (Acute) Health Hazard: No.
Delayed (Chronic) Health Hazard: No.
Fire Hazard: No.
Sudden Release of Pressure: No.
Reactive: No.

SARA Section 313: None

TSCA inventory: All components of this product are listed on the TSCA inventory.

NFPA

Health Hazard: 1

Flammability: 0

Reactivity: 0

HMIS

Health Hazard: 1

Flammability: 0

Physical hazard: 0

PPE: A

Section 16 : OTHER INFORMATION

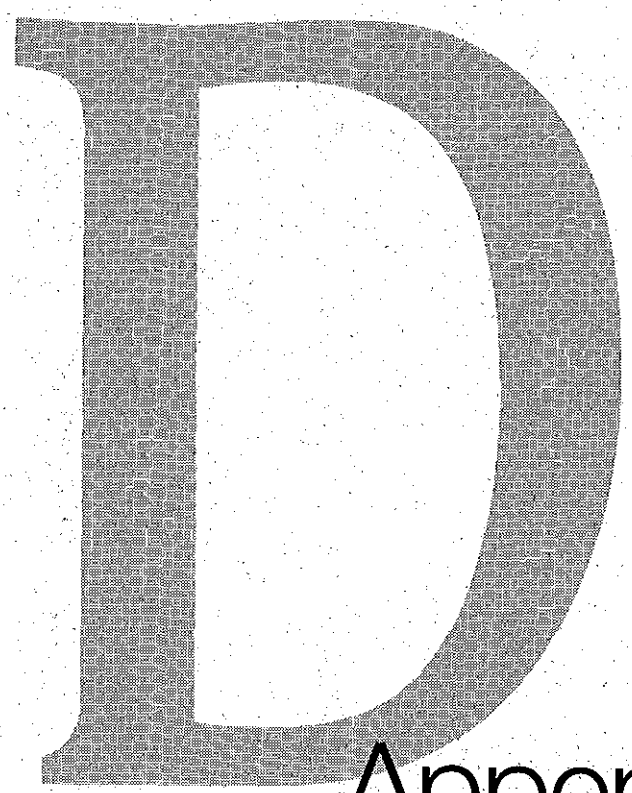
Supplier MSDS date: 2006/07/14

Data prepared by: Global Safety Management
3340 Peachtree Road, #1800
Atlanta, GA 30326

Phone: 877-683-7460
Fax: (877) 683-7462

Web: www.globalsafetynet.com
Email: info@globalsafetynet.com.

General note: This material safety data sheet was prepared from information obtained from various sources, including product suppliers and the Canadian Center for Occupational Health and Safety.



Appendix D

APPENDIX D
OSHA POSTER

Job Safety and Health

It's the law!

OSHA

Occupational Safety and Health Administration
U.S. Department of Labor

EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

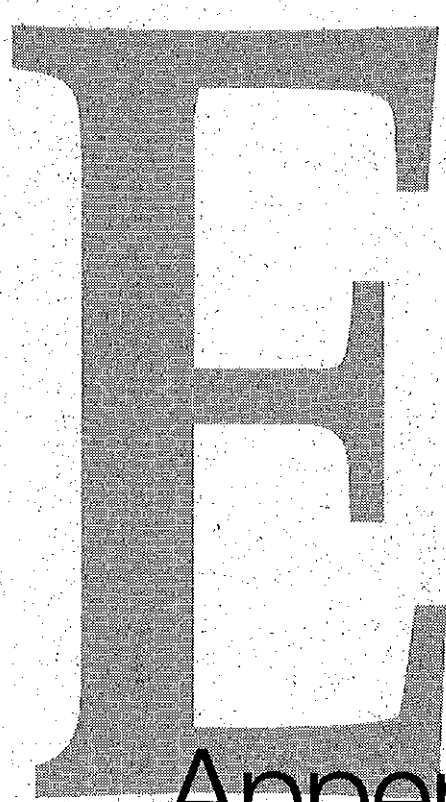
- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

This free poster available from OSHA –
The Best Resource for Safety and Health

Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

1-800-321-OSHA
www.osha.gov

OSHA 3165-12-06R



Appendix E

APPENDIX E
INJURY ILLNESS REPORT FORM

CDM

Injury / Illness Report

Section 1: To be completed by Employee, Direct Manager or Resource Manager, Information about Injured, Ill, or Involved Employee:

First Name: Middle Initial: Last Name:

Employee Address: Employee Home Phone No.:

SSN: Sex: ☐ M ☐ F Birth Date: Age:

Employee Number: Division: Work week:

Employee Status: ☐ CDM Work Location Code: choose code or or

Or

☐ Subcontractor ☐ Federal Work Location Code: choose code

☐ CCI Work Location Code: choose code or

Name of Subcontractor Firm: Address and Phone No.:

Employment Category:
Select Item:

Length of Employment:
Select Item:
Date of Hire: _____

Time in Occupation:
Select Item:

Employee Signature:

Employee Work Phone No.:
Manager Work Phone No.:

Section 2: To be completed by Employee, Direct Manager or Resource Manager, Information about Accident/Injury/Illness:

Date of Accident/Incident: Time:

Specific Location of Accident/Incident:

Witness(es) to the Accident/Incident:

Employee's Usual Occupation:

Occupation at Time of Accident/Incident:

Direct Manager or Resource Manager:

Injury or Illness? ☐ Injury ☐ Illness Vehicle Involved? ☐ Yes ☐ No

Property Damage? ☐ Yes ☐ No

Phase of Employee's Workday at Time of Injury:

☐ Performing Work Duties ☐ During Meals ☐ Inactive Work Period

☐ Entering or Leaving Workplace ☐ Other

General Type of Task Being Performed at Time of Injury/Illness: _____

Specific Activity Being Performed at Time of Injury/Illness: _____

Employee Was Working:

☐ Alone ☐ With a Crew or Fellow Worker ☐ Other Crew Size: _____

Supervision at Time of Accident:

☐ Directly Supervised ☐ Indirectly Supervised ☐ Not Supervised ☐ Supervision Not Feasible

Supervisor's Name: _____

Description of Accident:
Recommendations for Corrective Actions (to be completed by the employee and his or her manager):
Name, Address, and Phone Number of Attending Physician (If Applicable):
Name and Address of Hospital:
Description of First Aid or Medical Treatment Provided to Injured Employee:

Section 3: Evaluation of Accident, Illness or Incident

Body Part Affected (check all that are applicable):

Head:	Limbs:	Trunk:	Other Explain: _____
Select Item:	Select Item:	Select Item:	

Injury Type (check all that are applicable):

Chemical:	Physical:	Biological:	Other Explain: _____
Select Item:	Select Item:	Select Item:	

Injury Source (check all that are applicable):

A through G:	H through P:	Q through Z:	Other Explain: _____
Select Item:	Select Item:	Select Item:	

Accident Type (check all that are applicable):

Select Item:	Select Item:	Select Item:	Other Explain: _____

Hazardous Conditions (check all that are applicable):

Select Item:	Select Item:	Select Item:	Other Explain: _____

Accident Part Code (check all that are applicable):

Select Item:	Select Item:	Select Item:	Other Explain: _____

Place a check in the box of each factor that applies to this incident.

EQUIPMENT – Was a Hazardous Condition a Contributing Factor?

- ☐ Defect in Equipment/ Tools
- ☐ Hazardous Condition Not Recognized
- ☐ Hazardous Condition Not Reported
- ☐ Employees Not Informed/Job Procedure Not Specified
- ☐ No Equipment Inspection Procedure
- ☐ Inspection Procedure Failed to Detect Hazard
- ☐ Correct Equipment/Tool Not Used
- ☐ Correct Equipment Not Available
- ☐ Employee Not Informed of Correct Equipment
- ☐ Substitute Equipment
- ☐ Equipment Design Contributed to Operator Stress/Error
- ☐ Design/Quality of Tool Contributed to Hazardous Condition
- ☐ Other/Unknown: _____

ENVIRONMENT – Was the Location/Position of Equipment, Materials, or Employee a Contributing Factor?

- ☐ Location/Position Contributed to a Hazardous Condition
- ☐ Hazardous Condition Not Recognized
- ☐ Hazardous Condition Not Reported
- ☐ Employees Not Informed of Correct Job Procedure for Hazard
- ☐ Employee Did Not Belong in the Area
- ☐ Hazardous Condition Not Visible to Employee
- ☐ Insufficient Workspace
- ☐ Poor Environmental Control
- ☐ Uncontrolled Release of Hazardous Material
- ☐ Other/Unknown: _____

PEOPLE – Was the Job Procedure(s) a Contributing Factor?

- ☐ Aggravation of a Pre-existing Condition
- ☐ No Written/Known Procedure
- ☐ Job Procedure Inadequate
- ☐ Employee Not Trained on Proper Job Procedure
- ☐ Employee Deviated from Proper Job Procedure
- ☐ Employee Not Physically/ Mentally Capable of Performing Job
- ☐ Job Procedure Too Difficult
- ☐ Job Procedure Encourages Deviation
- ☐ Other/Unknown: _____

PERSONAL PROTECTIVE EQUIPMENT

- ☐ Employee Not Using PPE
- ☐ PPE Not Specified for Task
- ☐ PPE Unavailable
- ☐ Employee Not Advised of PPE
- ☐ Employee Not Properly Trained in PPE
- ☐ PPE Used Incorrectly
- ☐ PPE Inadequate
- ☐ Emergency Equipment Not Specified (Shower, Eyewash, Etc.)
- ☐ Emergency Equipment Not Available
- ☐ Emergency Equipment Not Used
- ☐ Emergency Equipment Malfunctioned
- ☐ Other/Unknown: _____

MANAGEMENT – Was a Management Defect a Contributing Factor?

- ☐ Supervisor Failed to Detect/ Anticipate/Report Hazardous Condition
- ☐ Supervisor Failed to Detect/Correct Deviations from Job Procedure
- ☐ No Supervisor Review of Hazards and Job Procedures
- ☐ Supervisor Responsibility Not Defined/Understood
- ☐ Supervisor Not Trained in Accident Prevention
- ☐ Failure to Initiate Corrective Action for Known Hazard
- ☐ Other/Unknown _____

OCCUPATIONAL HEALTH – Was a Chemical pr Physical Agent a Contributing Factor?

Physical Agent

- ☐ Noise. Vidration
- ☐ Temperature Extremes
- ☐ Ionizing Radiation – X, Gamma, Beta, or Alpha Radiation
- ☐ Non-ionizing Radiation – Microwave, Laser, Ultraviolet, or Radio Frequency
- ☐ Ergonomic – Repetitive Motion Trauma, Inappropriate Lighting, Glare, Incorrect or Insufficient Tooling, Benches, Seating

Chemical Agent

- ☐ Solvents — Solvent Name:
- ☐ Acid, Bases — Acid or Base Name:
- ☐ Particulates — Particulate Name:
- ☐ Other Toxic Chemicals — Chemical Name:

Biological Agent

- ☐ Microorganism — Microorganism:
- ☐ Insect — Insect's Name:
- ☐ Animal — Animal Species:
- ☐ Allergend — Allergen Name:

CORRECTIVE ACTION(s) REQUIRED:

ASSIGNED TO:

Direct Manager or RM: Date:

HSC or HSM: Date:

Corp. Human Resources: Date:

Section 4: To be filled out by Health and Safety Manager, Accident, Illness, Incident Classification:

Injury/Illness Severity:

- ☐ First Aid Only
- ☐ Medical Treatment
- ☐ Lost Workdays – Restricted Activity
- ☐ Lost Workdays – Away from Work
- ☐ Fatality Date: _____
- ☐ Total Number of Lost Days: _____

OSHA Illness Code:

- ☐ Occupational Skin Diseases or Disorders
- ☐ Dust Diseases of the Lungs
- ☐ Respiratory Conditions Due to Toxic Agents
- ☐ Poisoning
- ☐ Disorders Due to Physical Agents
- ☐ Disorders Associated with Repeated Trauma
- ☐ All Other Occupational Illnesses

For Office Use Only:

Case Nos. of Others Injured, Ill, or Involved in the Same Accident:

Case No.: OSHA Recordable? ☐ Yes ☐ No

Region: Address:

Project No.: Accident or Diagnosis Date:

Photos Relating to Accident/Injury

(Make copies of this page as necessary)

Insert photos here

Witness Statement – To Be Completed by Witness to The Accident

(Make copies of this page as necessary)

Name: Employer:

Address: Position/Craft:

Phone:

This statement is in reference to:

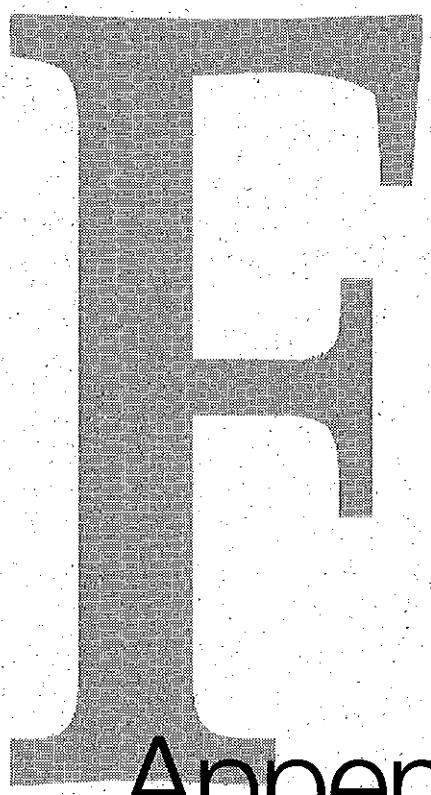
Site of accident (job name, location):

Date of accident:

Describe what you know about the accident, what you saw or heard, what you were doing before the accident, what you did after the accident (Use additional pages as necessary):

This statement is true to the best of my knowledge and memory.

Signature: Date:



Appendix F

APPENDIX F
EMPLOYEE MEETING RECORD

CDM Federal
EMPLOYEE MEETING RECORD

Date:_____ Project # or office location:_____

Time:_____ Instructor:_____

Duration of training:_____

Topics discussed:_____

Printed Name	Employee Number	Signature